U.S. Environmental Protection Agency
Office of Water (4303T)
1200 Pennsylvania Avenue, NW
Washington, DC 20460

EPA-821-B-03-001

Development Document For The Final Effluent Limitations Guidelines and Standards For The Metal Products & Machinery Point Source Category

EPA-821-B-03-001

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February 2003

U.S. Environmental Protection Agency

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ACKNOWLEDGMENTS AND DISCLAIMER

The Agency would like to acknowledge the contributions of Shari Barash, Yu-Ting Guilaran, Carey Johnston, Jan Matuszko, Marvin Rubin, Marla Smith, and Richard Witt to development of this technical document. In addition, EPA acknowledges the contribution of Eastern Research Group, Westat, Abt Associates, and Science Applications International Corporation.

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TABLE OF CONTENTS

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

TABLE OF CONTENTS (Continued)

Page

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF TABLES (Continued)

LIST OF FIGURES

Page

LIST OF FIGURES (Continued)

LIST OF FIGURES (Continued)

Page

1.0 SUMMARY AND SCOPE OF THE REGULATION

This section presents a brief overview of the Metal Products and Machinery (MP&M) Point Source Category, discusses the applicability of the MP&M effluent limitations guidelines and standards for the category, and presents the applicability interface between the final rule and other regulations for the metals industry. This section also briefly summarizes the final rule and describes the Agency's efforts to protect confidential business information. This section is organized as follows:

- Section 1.1 - Overview of the MP&M Point Source Category;
- Section 1.2 - Overlap with other effluent guidelines;
- Section 1.3 - Summary of applicability;
- Section 1.4 - Promulgated effluent limitations guidelines and standards; and
- Section 1.5 - Protection of confidential business information.

1.1 Overview of the MP&M Point Source Category

The MP&M Point Source Category includes facilities that discharge wastewater from processing metal parts, metal products, and machinery. This processing can be described by two types of activities: manufacturing and rebuilding/maintenance. Manufacturing is the series of unit operations necessary to produce metal products and is generally performed in a production environment. Rebuilding/maintenance is the series of unit operations necessary to disassemble used metal products into components, replace the components or subassemblies or restore them to original function, and reassemble the metal product. Rebuilding and maintenance operations are intended to keep metal products in operating condition and can be performed in either a production or a nonproduction environment. The MP&M Point Source Category encompasses manufacturing, rebuilding, or maintenance of metal parts, products, or machines for use in the following industrial sectors:

- Aerospace;
- Aircraft;
- Bus and Truck;
- Electronic Equipment;
- Hardware;
- Household Equipment;
- Instruments;
- Mobile Industrial Equipment;
- Motor Vehicle;
- Office Machine;

- Ordnance;
- Precious Metals and Jewelry;
- Railroad;
- Ships and Boats;
- Stationary Industrial Equipment; and
- Miscellaneous Metal Products.

EPA also evaluated manufacturing, rebuilding, or maintenance of metal parts, products, or machines used in two other industrial sectors (Job Shops and Printed Wiring Board) but has decided not to regulate them as part of the final rule.

These sectors considered by EPA for regulation manufacture, maintain, and rebuild metal products under more than 200 different Standard Industrial Classification (SIC) codes. Appendix A includes a list of example SIC codes and North American Industrial Classification System (NAICS) codes that apply to the above industrial sectors. EPA is not revising limitations and standards for three proposed industrial sectors (i.e., job shops, printed wiring board, and steel forming and finishing).

The final rule does not apply to maintenance or repair of metal parts, products, or machines that takes place only as ancillary activities at facilities not included in the 16 MP&M industrial sectors. EPA estimates that these ancillary repair and maintenance activities would typically discharge *de minimis* quantities of process wastewater. For example, wastewater discharges from repair of metal parts at oil and gas extraction facilities (40 CFR 435) are not subject to the final rule. The Agency has determined that permit writers are establishing limits using best professional judgment (BPJ) to regulate wastewater discharges from ancillary waste streams for direct dischargers (see 66 FR 433).

Facilities in any one of the 16 industrial sectors in the MP&M Point Source Category are subject to the final rule only if they directly discharge process wastewater resulting from one or more of the following “oily operations:”

- Abrasive Blasting;
- Adhesive Bonding;
- Alkaline Cleaning for Oil Removal;
- Alkaline Treatment Without Cyanide;
- Aqueous Degreasing;
- Assembly/Disassembly;
- Burnishing;
- Calibration;
- Corrosion Preventative Coating (as specified at 40 CFR 438.2(c) and Appendix C of Part 438);
- Electrical Discharge Machining;
- Floor Cleaning (in Process Area);
- Grinding;

- Heat Treating;
- Impact Deformation;
- Iron Phosphate Conversion Coating;
- Machining;
- Painting-Spray or Brush (Including Water Curtains);
- Polishing;
- Pressure Deformation;
- Solvent Degreasing;
- Steam Cleaning;
- Testing (e.g., hydrostatic, dye penetrant, ultrasonic, magnetic flux);
- Thermal Cutting;
- Tumbling/Barrel Finishing/Mass Finishing/Vibratory Finishing;
- Washing (Finished Products);
- Welding;
- Wet Air Pollution Control for Organic Constituents; and
- Suboperations within the operations listed above (see Section 5.0).

These operations are defined in Appendix B to 40 CFR 438 and also in Section 4.0.

In addition, the final rule covers process wastewater resulting from associated rinses that remove materials that the processes listed above deposit on the surface of the work piece. The final rule does not apply to direct discharges of wastewaters that are otherwise covered by other effluent limitations guidelines.

The final rule also covers direct discharges of process wastewater generated from oily operations related to maintenance and repair of metal products, parts, and machinery at military installations (i.e., federal facilities) as well as facilities owned or operated by state or local governments. For example, the final rule covers direct discharges of process wastewater generated from oily operations related to maintenance and repair of aircraft, cars, trucks, buses, tanks (or other armor personnel carriers), and industrial equipment. These operations are commonly performed at military installations and state or local government maintenance facilities. However, the final rule does not apply to wastewater discharges introduced into a federally owned and operated Treatment Works Treating Domestic Sewage (TWTDS), as defined at 40 CFR 122.2.

The MP&M Point Source Category evaluated for the final rule encompasses more than 41,000 facilities that manufacture, rebuild, or maintain metal parts, products, or machines for use in the 16 MP&M industrial sectors. Approximately 29,000 of these facilities annually discharge 5.02 billion gallons of process wastewater. Of the facilities discharging process wastewater, EPA estimates that 91.6 percent are indirect dischargers, 8.4 percent are direct dischargers, and 0.1 percent discharge both directly and indirectly. The Agency estimates that the remaining facilities (an estimated 12,000) fall into one of three categories:

- *Zero discharge*. A zero-discharging facility does not discharge pollutants to waters of the United States or to a POTW. Included in this definition are discharge or disposal of pollutants by way of evaporation, deep-well injection, off-site transfer to a treatment facility, and land application.

- *Non-water-using*. A non-water-using facility does not use process wastewater (i.e., water that comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product) at its oily operation.

- *Contract haulers*. Contract hauling is the removal of any waste stream from a facility by a company authorized to transport and dispose of the waste, excluding discharges to sewers or surface waters.

The MP&M final rule does not regulate indirect dischargers and discharges to federally owned and operated TWTDS. There are approximately 2,400 direct dischargers regulated by the MP&M final rule.

MP&M sites evaluated for the final rule perform a wide variety of process unit operations on metal parts, products, or machines. In general, MP&M unit operations can be characterized as belonging to one of the following types of unit operations:

- Assembly/disassembly operations;
- Metal shaping operations;
- Organic chemical deposition operations;
- Surface finishing operations; and
- Surface preparation operations.

EPA also evaluated the following types of unit operations but has decided not to regulate them as part of the final rule:

- Dry dock operations; and
- Metal deposition operations.

Specifically, EPA decided not to regulate "metal-bearing operations" as defined in 40 CFR 438.2(d) and Appendix C to Part 438. The list of unit operations not regulated by the final rule is also given in Section 4.0.

At a given MP&M facility, the specific unit operations performed and the sequence of those operations depend on many factors, including the activity (i.e., manufacturing, rebuilding, or maintenance), industrial sector, and type of product processed. The extent to which a facility uses process water for these unit operations also varies from site to site.

The approximately 2,400 sites regulated by the MP&M final rule discharge approximately 267 million gallons of process wastewater per year. This wastewater typically contains total suspended solids, oil and grease, and organic pollutants. MP&M wastewater may also contain some metals (e.g., zinc, tin, aluminum), often in suspended or particulate phase.

1.2 Overlap with Other Effluent Guidelines

EPA has previously established effluent limitations guidelines and standards for 13 industries that may perform unit operations or process parts that are sometimes found at MP&M sites. These effluent guidelines are:

- Electroplating (40 CFR 413);
- Iron and Steel Manufacturing (40 CFR 420);
- Nonferrous Metals Manufacturing (40 CFR 421);
- Ferroalloy Manufacturing (40 CFR 424);
- Metal Finishing (40 CFR 433);
- Battery Manufacturing (40 CFR 461);
- Metal Molding and Casting (40 CFR 464);
- Coil Coating (40 CFR 465);
- Porcelain Enameling (40 CFR 466);
- Aluminum Forming (40 CFR 467);
- Copper Forming (40 CFR 468);
- Electrical and Electronic Components (40 CFR 469); and
- Nonferrous Metals Forming & Metal Powders (40 CFR 471).

In 1986, the Agency reviewed coverage of these regulations and identified a significant number of metals-processing facilities discharging wastewater that these 13 regulations did not cover. Based on this review, EPA performed a more detailed analysis of these unregulated sites and identified the discharge of significant amounts of pollutants (see Section 1.1 of the rulemaking record, DCN M432). This analysis resulted in the decision to develop national limitations guidelines and standards for the "Metal Products and Machinery" (MP&M) Point Source Category (see Section 2.2.5).

Table 1-1 summarizes the coverage of industrial operations by each MP&M subcategory for which EPA proposed regulations. Additionally, the MP&M final rule does not apply to process wastewaters from metal-bearing operations (as defined at §438.2(d) and Appendix C of Part 438) or process wastewaters that are subject to the limitations and standards of other effluent limitations guidelines (e.g., Metal Finishing (40 CFR 433) or Iron and Steel Manufacturing (40 CFR 420)).

Table 1-1

Clarification of Coverage by Proposed MP&M Subcategory

Proposed Subcategory	Continue to Cover Under 40 CFR 413 (Electroplating)	Continue to Cover Under 40 CFR 433 (Metal Finishing)	Cover Under 40 CFR 438 (Metal Products & Machinery)
General Metals (Including Continuous Electroplaters)	Existing indirect dischargers covered by Part 413.	New and existing direct and indirect dischargers covered by Part 433.	None
Metal Finishing Job Shops	Existing indirect dischargers covered by Part 413.	New and existing direct and indirect dischargers covered by Part 433.	None
Non-Chromium Anodizing	Existing indirect dischargers covered by Part 413.	New and existing direct and indirect dischargers covered by Part 433.	None
Printed Wiring Board (Printed Circuit Board)	Existing indirect dischargers covered by Part 413.	New and existing direct and indirect dischargers covered by Part 433.	None
Steel Forming and Finishing[a]	NA	NA	None
Oily Wastes	NA	NA	All new and existing direct dischargers (see 438.10).
Railroad Line Maintenance	NA	NA	None
Shipbuilding Dry Dock	NA	NA	None

NA - Not applicable.

[a]These facilities will remain subject to 40 CFR 420.

1.3 Summary of Applicability

The MP&M effluent limitations guidelines and standards regulate process wastewater from oily operations at existing or new direct dischargers engaged in manufacturing, rebuilding, or maintenance of metal parts, products, or machines used in any of the 16 industrial sectors listed in Section 1.1. The guidelines and standards do not apply to wastewater from oily operations in certain circumstances (e.g., if they are subject to other national effluent limitations or standards). The MP&M regulation does not regulate any of the other subcategories for which it proposed regulations. These subcategories are the General Metals, Metal Finishing Job Shops, Non-Chromium Anodizing, Printed Wiring Board, Steel Forming and Finishing, Railroad Line Maintenance, and Shipbuilding Dry Dock. Process wastewater is defined in §438.2.

EPA defines process wastewater for the final rule to include wastewater discharges from oily operations for the manufacturing, rebuilding, or maintenance of metal parts, products, or machinery for use in any of the 16 MP&M industrial sectors and wastewater from air pollution control devices.

EPA notes that direct discharges resulting from the washing of cars, aircraft, or other vehicles, when performed as a prepatory step prior to one or more successive manufacturing, rebuilding, or maintenance operations, are subject to the MP&M rule.

Nonprocess wastewater discharges are not subject to the final rule. Nonprocess wastewater means sanitary wastewater, noncontact cooling water, water from laundering, and noncontact stormwater. Nonprocess wastewater for this part also includes wastewater discharges from nonindustrial sources such as residential housing, schools, churches, recreational parks, shopping centers as well as wastewater discharges from gas stations, utility plants, and hospitals.

In addition to nonprocess wastewater, the final rule does not apply to wastewater generated from: (1) gravure cylinder and metallic platemaking conducted within or for printing and publishing facilities; (2) the washing of cars, aircraft or other vehicles when it is performed only for aesthetic/cosmetic purposes; (3) MP&M operations at gasoline stations (SIC Code 5541) or vehicle rental facilities (SIC Codes 7514 or 7519); or (4) unit operations performed by drum reconditioners/refurbishers to prepare metal drums for reuse.

As noted, EPA is also not promulgating limitations and standards for facilities in the proposed Shipbuilding Dry Dock Subcategory. The final rule does not cover wastewater generated on-board ships and boats when they are afloat (that is, not in dry docks or similar structures), flooding water, and dry dock ballast water (see 66 FR 445). For U.S. military ships, EPA is in the process of establishing standards to regulate discharges of wastewater generated on-board these ships when they are in U.S. waters and are afloat under the Uniform National Discharge Standards (UNDS) pursuant to section 312(n) of the Clean Water Act (CWA) (see 64 FR 25125, May 10, 1999).

Finally, as previously stated, the final rule does not apply to maintenance or repair of metal parts, products, or machines that takes place only as ancillary activities at facilities not included in the 16 MP&M industrial sectors.

See Section 15.0 for a more detailed discussion regarding applicability.

1.4 Promulgated Effluent Limitations Guidelines and Standards

EPA proposed effluent limitations and standards for eight subcategories. However, for reasons discussed in Section 9.0 and Section VI of the preamble to the final rule, the final rule establishes effluent limitations guidelines and standards for new and existing direct dischargers in one subcategory: Oily Wastes.

EPA may divide a point source category (e.g., MP&M) into groupings called "subcategories" to provide a method for addressing variations between products, raw materials, processes, and other factors that result in distinctly different effluent characteristics. Regulation of a category using subcategories allows each subcategory to have a uniform set of effluent limitations that take into account technological achievability and economic impacts unique to that subcategory. Grouping similar facilities into subcategories increases the likelihood that the regulations are practicable, and diminishes the need to address variations between facilities through a variance process. The CWA requires EPA, in developing effluent limitations guidelines and pretreatment standards, to consider a number of different subcategorization factors. (See Section 6.0 for a list of the factors considered for the final MP&M rule and a detailed discussion of subcategorization.)

EPA is promulgating concentration-based limits and standards for direct dischargers for the Oily Wastes Subcategory. However, the CWA authorizes permit writers to decide when it is most appropriate to implement mass-based limits. Guidance for setting limits is included in Section 15.0.

Table 1-2 summarizes the regulatory levels of control and selected technology bases EPA used in promulgating the limitations and standards presented in Table 1-3, Section 14.0, and 40 CFR 438, Subpart A (Oily Wastes Subcategory). Section 15.0 provides guidance to permit writers.

Table 1-2

Technology Bases for Promulgated MP&M Limitations and Standards

Subcategory	Regulatory Level	Selected Technology Option
Oily Wastes	BPT/BCT/NSPS	Pollution prevention; chemical emulsion breaking and oil/water separation (Option 6). See Section 9.7.
	BAT	No limitations established under Part 438.
	PSES/PSNS	No standards established under Part 438.

Table 1-3

Effluent Limitations Guidelines for the MP&M Point Source Category (40 CFR 438)

BPT/BCT/NSPS - Oily Wastes Subcategory	
Regulated Parameter	**Maximum Daily mg/L (ppm)**
Total Suspended Solids (TSS)	62
Oil and Grease (as HEM)	46
pH	a

[a]Discharges must remain within the pH range 6 to 9.

1.5 Protection of Confidential Business Information

Whenever EPA is required to develop effluent limitations, pretreatment standards, or other standards, Section 308(a) of the CWA authorizes the Agency to require owners or operators of point sources to provide certain information. Various statutes under which EPA operates contain special provisions concerning the entitlement to confidential treatment of certain business information (CBI). In compliance with these statutes and EPA's implementing regulations, the Agency has withheld CBI from the public record in the Water Docket, but retains CBI in the nonpublic version of the rulemaking record. In addition, the Agency has withheld from disclosure some data not claimed as CBI because the release of these data could indirectly reveal CBI. Furthermore, EPA has aggregated certain data in the public record, masked facility identities, or used other strategies to prevent the disclosure of CBI. The Agency's approach to CBI protection ensures that the data in the public record both explain the basis for the final rule and provide the opportunity for public comment, without compromising data confidentiality.

2.0 BACKGROUND

This section presents background information supporting the development of effluent limitations guidelines and standards for the Metal Products and Machinery (MP&M) Point Source Category. Section 2.1 presents the legal authority to regulate the MP&M industry. Section 2.2 discusses the Clean Water Act, Pollution Prevention Act, Regulatory Flexibility Act (as amended by the Small Business Regulatory Enforcement Fairness Act of 1996), and prior regulation of the metals industry.

2.1 Legal Authority

EPA is promulgating these regulations under the authority of Sections 301, 304, 306, 307, 308, 402, and 501 of the Clean Water Act, 33 U.S.C.1311, 1314, 1316, 1317, 1318, 1342, and 1361 and under authority of the Pollution Prevention Act of 1990 (PPA), 42 U.S.C. 13101 et seq., Public Law 101-508, November 5, 1990.

2.2 Regulatory Background

2.2.1 Clean Water Act

Congress adopted the Clean Water Act (CWA) to ‘‘restore and maintain the chemical, physical, and biological integrity of the Nation’s waters’’ (Section 101(a), 33 U.S.C. 1251(a)). To achieve this goal, the CWA prohibits the discharge of pollutants into navigable waters except in compliance with the statute. The CWA confronts the problem of water pollution on a number of different fronts. Its primary reliance, however, is on establishing restrictions on the types and amounts of pollutants discharged from various industrial, commercial, and public sources of wastewater.

Congress recognized that regulating only those sources that discharge effluent directly into the nation’s waters would not be sufficient to achieve the CWA’s goals. Consequently, the CWA requires EPA to promulgate nationally applicable pretreatment standards that restrict pollutant discharges for those who discharge wastewater indirectly through sewers flowing to publicly owned treatment works (POTWs) (Sections 307(b) and (c), 33 U.S.C. 1317(b) and (c)). National pretreatment standards are established for those pollutants in wastewater from indirect dischargers that may pass through or interfere with POTW operations. Generally, pretreatment standards are designed to ensure that wastewater from direct and indirect industrial dischargers are subject to similar levels of treatment. In addition, EPA requires POTWs to implement local pretreatment limits applicable to their industrial indirect dischargers to satisfy any local requirements (40 CFR 403.5).

Direct dischargers must comply with effluent limitations in National Pollutant Discharge Elimination System (‘‘NPDES’’) permits; indirect dischargers must comply with pretreatment standards. EPA establishes these limitations and standards by regulation for

categories of industrial dischargers and bases them on the degree of control that can be achieved using various levels of pollution control technology.

1. Best Practicable Control Technology Currently Available (BPT)
(Section 304(b)(1) of the CWA)

BPT effluent limitations guidelines are applicable to direct dischargers (i.e., sites that discharge wastewater to surface water). BPT effluent limitations guidelines are generally based on the average of the best existing performance by facilities of various sizes, ages, unit processes or other common characteristics within the category or subcategory for control of conventional, priority, and nonconventional pollutants. Section 304(a)(4) designates the following as conventional pollutants: biochemical oxygen demand (BOD_5), total suspended solids (TSS), fecal coliform, pH, and any additional pollutants defined by the Administrator as conventional. The Administrator designated oil and grease as an additional conventional pollutant on July 30, 1979 (44 FR 44501). EPA has identified 65 pollutants and classes of pollutants as toxic pollutants, of which 126 specific substances have been designated priority toxic pollutants. See Appendix A to Part 403 (reprinted after 40 CFR 423.17). All other pollutants are considered to be nonconventional.

In establishing BPT effluent limitations guidelines, EPA first considers the total cost of applying the control technology in relation to the effluent reduction benefits. The Agency also considers the age of the equipment and facilities involved, the processes employed and any required process changes, engineering aspects of the control technologies, non-water quality environmental impacts (including energy requirements), and such other factors as the EPA Administrator deems appropriate (CWA 304(b)(1)(B)). Traditionally, EPA establishes BPT effluent limitations based on the average of the best performances of facilities within the industry of various ages, sizes, processes or other common characteristics. Where existing performance is uniformly inadequate, EPA may require higher levels of control than are currently in place in an industrial category if the Agency determines that the technology can be practically applied.

2. Best Conventional Pollutant Control Technology (BCT)
(Section 304(b)(4) of the CWA)

The 1977 amendments to the CWA established BCT for discharges of conventional pollutants from existing industrial point sources. BCT effluent limitations guidelines are applicable to direct discharging sites. In addition to other factors specified in Section 304(b)(4)(B), the CWA requires that EPA establish BCT limitations after consideration of a two-

part "cost-reasonableness" test. EPA explained its methodology for the development of BCT limitations in 1986 (51 FR 24974; July 9, 1986).

3. Best Available Technology Economically Achievable (BAT)
(Sections 304(b)(2) of the CWA)

BAT effluent limitations guidelines are applicable to direct discharging sites. In general, BAT effluent limitations guidelines represent the best available economically achievable performance of plants in the industrial subcategory or category. The CWA establishes BAT as the principal national means of controlling the direct discharge of priority pollutants and nonconventional pollutants to waters of the United States. The factors considered in assessing BAT include the cost of achieving BAT effluent reductions, the age of equipment and facilities involved, the processes employed, potential process changes, non-water quality environmental impacts (including energy requirements), and such factors as the Administrator deems appropriate. The Agency retains considerable discretion in assigning the weight to be accorded to these factors. As with BPT, where existing performance is uniformly inadequate, EPA may base BAT upon technology transferred from a different subcategory within an industry or from another industrial category. In addition, BAT may include process changes or internal controls, even when these technologies are not common industry practice.

4. New Source Performance Standards (NSPS)
(Section 306 of the CWA)

NSPS are applicable to new direct discharging sites and are based on the best available demonstrated treatment technology. New facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. As a result, NSPS should represent the greatest degree of effluent reduction attainable through the application of the best available demonstrated control technology for all pollutants (i.e., conventional, nonconventional, and priority pollutants). In establishing NSPS, the CWA directs EPA to take into consideration the cost of achieving the effluent pollutant reduction and any non-water quality environmental impacts (including energy requirements).

5. Pretreatment Standards for Existing Sources (PSES)
(Section 307(b) of the CWA)

PSES are applicable to indirect discharging sites (i.e., sites that discharge to a POTW). The CWA requires PSES for pollutants that pass through, interfere with, or are otherwise incompatible with POTW treatment

processes or sludge disposal methods. The CWA specifies that pretreatment standards are to be technology-based and analogous to the BAT effluent limitations guidelines.

The General Pretreatment Standards, which set forth the framework for implementing categorical pretreatment standards, are found at 40 CFR 403.

6. Pretreatment Standards for New Sources (PSNS)
(Section 307(c) of the CWA)

PSNS are applicable to new indirect discharging sites. Like PSES, PSNS are designed to prevent the discharges of pollutants that pass through, interfere with, or are otherwise incompatible with the operation of POTWs. PSNS are to be issued at the same time as NSPS. New indirect dischargers have the opportunity to incorporate into their plants the best available demonstrated technologies. The Agency considers the same factors in promulgating PSNS that it considers in promulgating NSPS.

The following table summarizes these regulatory levels of control and the pollutants controlled.

Table 2-1

Summary of Regulatory Levels of Control

Type of Sites Regulated	BPT	BCT	BAT	NSPS	PSES	PSNS
Existing Direct Dischargers	X	X	X			
New Direct Dischargers				X		
Existing Indirect Dischargers					X	
New Indirect Dischargers						X
Pollutants Regulated	**BPT**	**BCT**	**BAT**	**NSPS**	**PSES**	**PSNS**
Priority Pollutants	X		X	X	X	X
Nonconventional Pollutants	X		X	X	X	X
Conventional Pollutants	X	X		X		

Source: Clean Water Act.

EPA typically does not establish pretreatment standards for conventional pollutants (e.g., BOD_5, TSS, oil and grease) since POTWs are designed to treat these pollutants, but EPA has exercised its authority to establish categorical pretreatment standards for conventional pollutants as surrogates for toxic or nonconventional pollutants or to prevent interference. For example, EPA established categorical pretreatment standards for new and existing sources with a one-day maximum concentration of 100 mg/L oil and grease in the

Petroleum Refining Point Source Category (40 CFR 419) to "minimize the possibility of slug loadings of oil and grease being discharged to POTWs" (see Section 24.4 of the rulemaking record, DCN 17949).

2.2.2 Section 304(m) Requirements

Section 304(m) of the CWA, added by the Water Quality Act of 1987, requires EPA to establish schedules for: (1) reviewing and revising existing effluent limitations guidelines and standards; and (2) promulgating new effluent guidelines. On January 2, 1990, EPA published an Effluent Guidelines Plan (see 55 FR 80), in which schedules were established for developing new and revised effluent guidelines for several industry categories, including the metal products and machinery industry.

Natural Resources Defense Council, Inc. (NRDC) and Public Citizen, Inc. challenged the Effluent Guidelines Plan in a suit filed in the U.S. District Court for the District of Columbia, (NRDC et al v. Browner, Civ. No. 89-2980). On January 31, 1992, the Court entered a consent decree (the "304(m) Decree"), which establishes schedules for, among other things, EPA's proposal and promulgation of effluent guidelines for a number of point source categories. The consent decree, as amended, requires EPA to take final action on the Metal Products and Machinery effluent guidelines by February 14, 2003.

2.2.3 Pollution Prevention Act

The Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13101 et seq., Public Law 101-508, November 5, 1990) "declares it to be the national policy of the United States that pollution should be prevented or reduced whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or release into the environment should be employed only as a last resort..." (Sec. 6602; 42 U.S.C. 13101 (b)). In short, preventing pollution before it is created is preferable to trying to manage, treat or dispose of it after it is created. The PPA directs the Agency to, among other things, "review regulations of the Agency prior and subsequent to their proposal to determine their effect on source reduction" (Sec. 6604; 42 U.S.C. 13103(b)(2)). EPA reviewed this effluent guideline for its incorporation of pollution prevention.

According to the PPA, source reduction reduces the generation and release of hazardous substances, pollutants, wastes, contaminants, or residuals at the source, usually within a process. The term source reduction "include[s] equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control. The term ‘source reduction' does not include any practice which alters the physical, chemical, or biological characteristics or the volume of a hazardous substance, pollutant, or contaminant through a process or activity which itself is not integral to or necessary for the production of a product or the providing of a service." 42 U.S.C. 13102(5). In effect, source reduction means reducing the

amount of a pollutant that enters a waste stream or that is otherwise released into the environment prior to out-of-process recycling, treatment, or disposal.

EPA gathered information on pollution prevention practices used by the MP&M industry from site visits, survey responses, and other references. Typical pollution prevention practices include reducing water use, extending the life of process bath constituents, or adding recycle or reuse technologies. See Section 8.0 for a detailed discussion of these practices. EPA supports pollution prevention technology by including pollution prevention in its technology bases for the final MP&M effluent limitations and new source performance standards. This includes water conservation and reuse of lubricants and solvents. Technology options considered, as well as selected, as the basis for the MP&M effluent limitations guidelines and standards include pollution prevention practices and are discussed in Section 9.0.

2.2.4 Regulatory Flexibility Act (RFA) as Amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA)

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

For assessing the impacts of the final rule on small entities, a small entity is defined as: (1) a small business according to the Regulations of the Small Business Administration (SBA) at 13 CFR 121.201, which define small businesses for Standard Industrial Classification (SIC) codes; (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise that is independently owned and operated and is not dominant in its field.

In accordance with Section 603 of the RFA, EPA prepared an initial regulatory flexibility analysis (IRFA) for the proposed rule and convened a Small Business Advocacy Review Panel to obtain advice and recommendations of representatives of the regulated small entities in accordance with Section 609(b) of the RFA (see 66 FR 519). The results of IRFA are provided in Chapter 10 of the Economic, Environmental, and Benefits Analysis (EEBA) (EPA-821-B-03-002). The January 2001 proposed rule (see 66 FR 523) presents a summary of the Panel's recommendations and the full Panel Report (see Section 11.2, DCN 16127) presents a detailed discussion of the Panel's advice and recommendations.

A regulatory flexibility analysis addresses:

- The need for, objectives of, and legal basis for a rule.

- A description of, and where feasible, an estimate of the number of small entities to which a rule would apply.

- The projected reporting, recordkeeping, and other compliance requirements of a rule, including an estimate of the classes of small entities that would be subject to a rule and the types of professional skills necessary for preparation of the report or record.

- An identification, where practicable, of all relevant federal rules that may duplicate, overlap, or conflict with a rule.

- A description of any significant regulatory alternatives to a rule that accomplish the stated objectives of applicable statutes and that minimize any significant economic impact of a rule on small entities. Consistent with the stated objectives of the CWA, the analysis discusses significant alternatives such as:

    - Establishing differing compliance or reporting requirements or timetables that take into account the resources available to small entities.

    - Clarifying, consolidating, or simplifying compliance and reporting requirements under the rule for such small entities.

    - Using performance rather than design standards.

    - Excluding from coverage of a rule, or any part thereof, such small entities. Based on the regulatory flexibility analysis and other factors, EPA considered an exclusion to eliminate disproportionate impacts on small businesses, which reduced the number of small businesses that would be affected by a rule.

The Small Business Advocacy Review Panel comprised representatives from three federal agencies: EPA, the Small Business Administration, and the Office of Management and Budget. The Panel reviewed materials EPA prepared in connection with the proposed rule IRFA, and collected the advice and recommendations of small entity representatives. For the Small Business Advocacy Review Panel, the small entity representatives included nine small MP&M facility owner/operators, one small municipality, and these six trade associations representing different sectors of the industry:

- National Association of Metal Finishers (NAMF)/Association of Electroplaters and Surface Finishers (AESF)/MP&M Coalition;

- Association Connecting Electronics Industries (also known as IPC);

- Porcelain Enamel Institute;
- American Short Line Railroad Association (ASLRA);
- Electronics Industry Association (EIA); and
- American Wire Producers Association (AWPA).

The Panel provided background information and analysis to the small entity representatives and conducted meetings with the representatives. The Panel asked the small entity representatives to submit written comment on the MP&M proposed rule in relation to the elements of the proposal IRFA. The Panel carefully considered these comments when developing their recommendations. The Panel's report summarizes their outreach to small entities and the comments submitted by the small entity representatives. The Panel's report also presented their findings on issues related to the elements of the proposal IRFA and recommendations regarding the rulemaking. Based on this input, EPA made several changes to the January 2001 proposal that reduced the number of small entities regulated and the level of impact to small entities that remain within the scope of the regulation.

In the final rule, EPA excluded direct dischargers in seven of eight proposed subcategories and indirect dischargers in all eight proposed subcategories. Consequently, EPA excluded most small entities from additional regulation (see Section VI of the MP&M preamble to the final rule and Chapter 10 of the EEBA). To assess the potential economic impact of the final rule on small entities regulated by the final rule, EPA drew on: (1) a comparison of compliance costs to revenue; and (2) the firm and facility impact analyses discussed in Chapters 9 and 10 of the EEBA.

First, EPA performed an analysis comparing annualized compliance costs to revenue for small entities at the firm level. EPA found that none of the small firms are estimated to incur compliance costs equaling or exceeding one percent of annual revenue. Second, EPA drew on the facility impact analysis, which estimated facility closures and other adverse changes to financial condition (referred to as "moderate impacts"). See Chapter 5 of the EEBA for details of EPA's analysis of closures and moderate impacts for privately owned businesses. This analysis indicated that the final rule would cause no regulated facilities owned by small entities to close or to incur moderate impacts. From these analyses, EPA determined that the final rule will not have a significant economic impact on a substantial number of small entities. See Chapter 10 of the EEBA for the final rule for a more detailed discussion of the economic impacts on small entities.

2.2.5 Regulatory History of the Metals Industry

EPA has promulgated effluent limitations guidelines and standards for 13 metals industries. These regulations cover metal manufacturing, metal forming, and component finishing, as summarized below.

Table 2-2

Summary of Metals Industry Effluent Guidelines

Coverage Area	Title	CFR Reference
Metal and Metal Alloy Manufacturing	Iron and Steel Manufacturing[a]	40 CFR 420
	Nonferrous Metals Manufacturing	40 CFR 421
	Ferroalloy Manufacturing	40 CFR 424
Metal Forming	Iron and Steel Manufacturing[a]	40 CFR 420
	Metal Molding and Casting	40 CFR 464
	Aluminum Forming	40 CFR 467
	Copper Forming	40 CFR 468
	Nonferrous Metals Forming and Metal Powders	40 CFR 471
Component Finishing	Electroplating	40 CFR 413
	Iron and Steel Manufacturing[a]	40 CFR 420
	Metal Finishing	40 CFR 433
	Battery Manufacturing	40 CFR 461
	Coil Coating	40 CFR 465
	Porcelain Enameling	40 CFR 466
	Electrical and Electronic Component Manufacturing	40 CFR 469

Source: Code of Federal Regulations, Part 40.

[a]The Iron and Steel Manufacturing category includes metal manufacturing, metal forming, and component finishing.

In 1986, the Agency reviewed these 13 regulations and identified a significant number of metals-processing facilities discharging wastewater that these regulations did not cover. Based on this review, EPA performed a detailed analysis of these unregulated sites and identified the discharge of significant amounts of pollutants. This analysis resulted in a preliminary decision to consider new regulations for a Machinery Manufacturing and Rebuilding (MM&R) Point Source Category. In 1989, the Agency published a Preliminary Data Summary (PDS) for the MM&R industry, which is located in the MP&M Public Record (Section 1.1, DCN M432). The preliminary study of the unregulated MP&M facilities indicated the following:

- The number of facilities, wastewater flow, and toxic and nonconventional pollutant loads were significant;
- The large quantities of toxic pollutants discharged threatened the treatment capability of many POTWs as found by the Domestic Sewage Study;
- There were gaps in federal regulatory coverage in the electroplating, metal finishing, and electrical and electronic components categories;
- Pollutant concentrations were at treatable levels and at levels as high and sometimes higher than concentrations in wastewater from other regulated categories; and

- Some MP&M operations generate hazardous solid waste and sludge that could impact hazardous waste disposal.

Based on information contained in the PDS, EPA divided the MM&R category into two phases by major industrial groups or sectors. The Agency announced its schedule for the development of effluent guidelines for two separate MM&R phases in EPA's January 2, 1990 Effluent Guidelines Plan (55 FR 80). One of the primary reasons for dividing the category into two phases was the large number of facilities (over 900,000) identified in the PDS as potentially included in the MM&R Point Source Category. On May 7, 1992, EPA changed the category name to Metal Products and Machinery (MP&M) to clarify the coverage of the category (57 FR 19748). Many questionnaire respondents found the MM&R label confusing and interpreted the category to apply only to machinery sites. The Agency believes that the MP&M title more accurately describes the coverage of the category.

As mentioned in Section 2.2.2, NRDC and Public Citizen, Inc. challenged the Effluent Guidelines Plan in a suit filed in U.S. District Court for the District of Columbia (NRDC et al. v. Browner, Civ. No. 89-2980). Under a consent decree in this litigation, EPA developed a plan to promulgate effluent guidelines for, among others, the MP&M Point Source Category. The 1992 Effluent Guidelines Plan provided for EPA to propose effluent guidelines for the MP&M Phase I Category by November 1994 and take final action by May 1996. Based on a motion filed by EPA on September 28, 1994, the court granted an extension for proposal and promulgation of the final regulation. To make the regulation more manageable, EPA initially divided the industry into two phases based on industrial sectors. The Phase I proposal included the following industry sectors: Aerospace; Aircraft; Electronic Equipment; Hardware; Mobile Industrial Equipment; Ordnance; and Stationary Industrial Equipment. At that time, EPA planned to propose a rule for the Phase II sectors approximately three years after the MP&M Phase I proposal. Phase II sectors included: Bus & Truck, Household Equipment, Instruments, Job Shops, Motor Vehicles, Office Machines, Precious Metals and Jewelry, Printed Wiring Boards, Railroad, Ships and Boats, and Miscellaneous Metal Products.

On May 30, 1995, EPA published the MP&M Phase I proposal (60 FR 28210). EPA proposed effluent limitations guidelines, pretreatment standards, and new source performance standards for the seven MP&M Phase I industrial sectors. EPA received over 350 public comments on the Phase I proposal requesting that the Agency combine all MP&M industrial sectors into one effluent guideline. Commentors raised concerns regarding the regulation of similar facilities with different compliance schedules and potentially different limitations solely based on whether they were in a Phase I or Phase II MP&M industrial sector. Furthermore, many facilities performed work in multiple sectors. In such cases, permit writers and control authorities (e.g., POTWs) would need to decide which MP&M rule (Phase I or II) applied to a facility.

Based on these comments and after negotiations with NRDC, EPA proposed merging the two phases into one rule (61 FR 35042; July 3, 1996). In 1997, EPA obtained approval from the U.S. District Court for the District of Columbia to combine MP&M Phases I

and II into a single regulation for the 18 MP&M industrial sectors and to extend the effluent guidelines schedule (62 FR 8726; February 26, 1997). Extension of the schedule allowed EPA to use POTW survey data to develop more precise estimates of administrative burden and allowed more extensive stakeholder involvement for data collection. Under the Consent Decree as amended, EPA is required to take final action on the MP&M rule by February 14, 2003.

EPA published a new proposal on January 3, 2001 (66 FR 424), which completely replaced the 1995 proposal. EPA proposed to establish new effluent limitations and guidelines and standards for 18 MP&M industrial sectors (without any designation of "Phase I or II") and divided the industry into eight regulatory subcategories: General Metals, Metal Finishing Job Shops, Printed Wiring Board, Non-Chromium Anodizing, Steel Forming and Finishing, Oily Wastes, Railroad Line Maintenance, and Shipbuilding Dry Dock (see 66 FR 439 for a discussion of the proposal subcategorization scheme).

EPA found two basic types of waste streams in the industry: (1) wastewater with high metals content (metal-bearing), and (2) wastewater with low concentration of metals and high oil and grease content (oil-bearing). When looking at facilities generating metal-bearing wastewater (with or without oil-bearing wastewater), EPA identified five groups of facilities that could potentially be subcategorized by dominant product, raw materials used, and/or nature of the waste generated (i.e., General Metals, Metal Finishing Job Shops, Printed Wiring Board, Non-Chromium Anodizing, and Steel Forming and Finishing). When evaluating facilities with only oil-bearing wastewater for potential further subcategorization, EPA identified two types of facilities (i.e., Railroad Line Maintenance and Shipbuilding Dry Dock) that were different from the other facilities in the Oily Wastes Subcategory based on size, location, and dominant product or activity. This subcategorization scheme allowed EPA to more accurately assess various technology options in terms of compliance costs, pollutant reductions, benefits, and economic impacts.

EPA proposed new limits and standards for direct dischargers in all eight MP&M subcategories and proposed pretreatment standards for all indirect dischargers in three subcategories (i.e., Metal Finishing Job Shops, Printed Wiring Board, and Steel Forming and Finishing); pretreatment standards for facilities above a certain wastewater flow volume in two subcategories (i.e., General Metals and Oily Wastes); and no national pretreatment standards for facilities in three subcategories (i.e., Non-Chromium Anodizing, Railroad Line Maintenance, and Shipbuilding Dry Dock). EPA received over 1,500 comment letters on the 2001 proposal.

On June 5, 2002, EPA published a Notice of Data Availability (NODA) at 67 FR 38752. In the NODA, EPA discussed major issues raised in comments on the 2001 proposal; suggested revisions to the technical and economic methodologies used to estimate compliance costs, pollutant loadings, and economic and environmental impacts; presented the results of these suggested methodology changes and incorporation of new (or revised) data; and summarized the Agency's thinking on how these results could affect the Agency's final decisions.

The NODA also included a discussion of possible alternative options for certain subcategories based on comments, including an Environmental Management System (EMS) alternative in lieu of Part 438 limitations and standards, and a discussion of "upgrading" sites currently regulated under the Electroplating regulations (40 CFR 413) to meet the Metal Finishing regulations (40 CFR 433) (see 67 FR 38797). Finally, the NODA included preliminary revised effluent limitations and pretreatment standards for all eight proposed subcategories. EPA received over 300 comment letters on the NODA. EPA's responses to comments on the May 1995 proposal, January 2001 proposal, and June 2002 NODA can be found in Section 20.3 of the rulemaking record.

3.0 DATA COLLECTION ACTIVITIES

This section summarizes the Agency's data collection activities for the MP&M rulemaking effort. Section 3.1 summarizes the 1989 and 1996 MP&M industry questionnaires including their purpose, recipient selection process, types of information collected, and uses of data. Sections 3.2 and 3.3 summarize the site visit and field sampling programs, respectively, conducted at facilities performing proposed MP&M operations.[1] Sections 3.4, 3.5, and 3.6 discuss other data sources.

3.1 Industry Questionnaires

EPA distributed two screener and six detailed questionnaires (surveys) as part of the data collection effort for the MP&M rulemaking. As discussed in Section 2.0, EPA initially divided the MP&M Point Source Category into two phases by major industrial sectors. The surveys distributed for the seven Phase I industrial sectors requested data reflecting 1989 operations, and the surveys distributed for the 11 Phase II industrial sectors requested data reflecting 1996 operations. The table below lists the industry surveys and the distribution dates. Sections 3.1.1 and 3.1.2 discuss these questionnaire efforts.

Distribution of the MP&M Industry Surveys

Type of Survey	Survey Name	Distribution Date
Screener	1989 Screener Survey	8/90
	1996 Screener Survey	12/96
	1996 Benefits Screener	10/98
Detailed	1989 Detailed Survey	1/91
	1996 Long Detailed Survey	6/97
	1996 Short Detailed Survey	9/97
	1996 Municipality Detailed Survey	6/97
	1996 POTW Detailed Survey	11/97
	1996 Federal Detailed Survey	4/98

During the same time that EPA was developing the MP&M Point Source Category rulemaking, EPA was also updating the effluent limitations guidelines and standards for the Iron and Steel Point Source Category. As part of the revised Iron and Steel rulemaking, EPA distributed detailed and short surveys to iron and steel facilities. Following receipt of the 1997 Iron and Steel Surveys, EPA evaluated whether some facilities may be more appropriately covered under the MP&M Point Source Category.

[1]Note: EPA evaluated a number of unit operations for the May 1995 proposal, January 2001 proposal, and June 2002 NODA (see Tables 4-3 and 4-4). However, EPA selected a subset of these unit operations for regulation in the final rule (see Section 1.0). For this Section, the term "proposed MP&M operations" means those operations evaluated for the two proposals, NODA, and final rule. The term "final MP&M operations" means those operations defined as "oily operations" (see Section 1.0, 40 CFR 438.2(f), and Appendix B to Part 438) and regulated by the final rule.

EPA included data from 154 iron and steel surveys in the MP&M survey database and proposed to create a new subcategory, the Steel Forming and Finishing Subcategory in the MP&M Point Source Category (see 66 FR 424). Based on comments on the January 2001 proposal and June 2002 NODA EPA concluded that those operations included in the proposed Steel Forming and Finishing Subcategory should remain subject to effluent guidelines at the Iron and Steel Point Source Category (40 CFR 420). See Section 6.0 for further discussion of subcategorization.

For this final rule, EPA also evaluated portions of the iron and steel surveys to determine if continuous electroplaters would be more appropriately covered under the MP&M Point Source Category, as described in the Notice of Data Availability (NODA) (67 FR 38752; June 5, 2002). EPA included these facilities in the General Metals Subcategory for evaluating options for the final rule. See Section 6.0 for further discussion of this determination. EPA has data for 47 continuous electroplating lines at 24 sites. The data for these lines were evaluated in developing the final MP&M effluent limitation guidelines and standards (see Section 3.1.3 for further discussion). A blank copy of the Iron and Steel Surveys and the relevant data from the 24 surveys are available in Section 5.3.6, DCN 16147 and Section 15.4.3 of the rulemaking record.

3.1.1 The 1989 Industry Surveys

EPA distributed a screener and a detailed survey for the Phase I MP&M proposed regulation to manufacturing, rebuilding, and/or maintenance facilities engaged in the following seven industrial sectors:

- Aerospace;
- Aircraft;
- Electronic Equipment;
- Hardware;
- Mobile Industrial Equipment;
- Ordnance; and
- Stationary Industrial Equipment.

The 1989 screener and detailed surveys are discussed below. EPA describes in detail the recipient selection, stratification schemes, and the type and potential use of the requested information in the Information Collection Request (ICR) for the 1989 screener and detailed MP&M industry surveys. The ICR can be found in Section 3.6.2 of the rulemaking record, DCN M15738.

3.1.1.1 1989 Screener Survey

In August and September 1990, EPA mailed 8,342 screener surveys (also referred to as the Mini Data Collection Portfolio (MDCP)) to sites believed to be engaged in manufacturing, rebuilding, or maintenance activities in one of the seven industrial sectors listed above. Mailout of the screener was the preliminary step in an extensive data-gathering effort for

these seven industrial sectors. The purpose of the screener was to identify sites to receive the more detailed survey and to make a preliminary assessment of these seven industrial sectors.

1989 Screener Recipient Selection and Distribution

EPA identified potential recipients from a Dun & Bradstreet database using Standard Industrial Classification (SIC) codes. The Agency identified more than 190 SIC codes applicable to the seven industrial sectors listed in Section 3.1.1. Within each sector, EPA identified between 1 and 40 SIC codes. EPA calculated the number of sites to receive the screener within each SIC code by a coefficient of variation (CV) minimization procedure, described in the Statistical Summary for the Metal Products & Machinery Industry Surveys (Section 10.0, DCN 16118). Based on the number of sites selected within each SIC code, the Agency purchased a list of randomly selected names and addresses from the Dun & Bradstreet database for each SIC code. This list included twice the number of sites specified by the CV minimization procedure for each SIC code.

EPA deleted sites from the purchased Dun & Bradstreet list for the following reasons: sites had SIC codes that were inconsistent with company names; sites were corporate headquarters without manufacturing, rebuilding, or maintenance operations; or sites had insufficient mailing addresses. EPA then randomly selected 30 to 60 sites within each SIC code and assigned each site a randomly selected identification number. EPA assigned each site identification number a corresponding barcode to track the distribution and processing of the screeners.

To examine trends and similarities in manufacturing across the industry sectors, EPA also sent screener surveys to some facilities performing manufacturing in the following eight industrial sectors:

- Bus and Truck;
- Household Equipment;
- Instruments;
- Motor Vehicles;
- Office Machines;
- Precious and Nonprecious Metals;
- Railroad; and
- Ships and Boats.

The Agency did not send the screener to sites whose SIC codes indicated that they were engaged in only rebuilding or maintenance (i.e., not manufacturing) operations in the eight industrial sectors listed above.

EPA maintained a toll-free helpline from August through October of 1990 to assist screener recipients in completing the survey. This helpline received approximately 900 calls from screener recipients. Additional information about the screener mailing (e.g., a copy of

the screener, specific mailing and processing procedures, non-CBI screener responses, follow-up letters, and notes from helpline telephone conversations) is contained in Sections 3.7, 3.8 and 5.3 of the rulemaking record.

1989 Screener Mailout Results

EPA mailed 8,000 screener surveys in August 1990. Based on the number of surveys returned undelivered, EPA mailed an additional 342 in September 1990. In addition, EPA received 22 unsolicited responses to the survey. Of the 8,364 potential respondents to the screener, including those who provided unsolicited responses, 7,846 received the screener. Screeners for the remaining 518 were returned to EPA as undeliverable. EPA assumed these sites to be out of business. Of the total potential respondents, 84 percent (6,981) returned the screener to EPA. A blank copy of the screener form and nonconfidential portions of the completed screeners are contained in the rulemaking record (see Section 3.7.2, DCN 17223, and Sections 3.7.1 and 5.3.7). Table 3-1 and Figure 3-1 summarize the mailout results for the 1989 and 1996 survey efforts.

Information Collected

The Agency requested the following site-specific information in the 1989 screener:

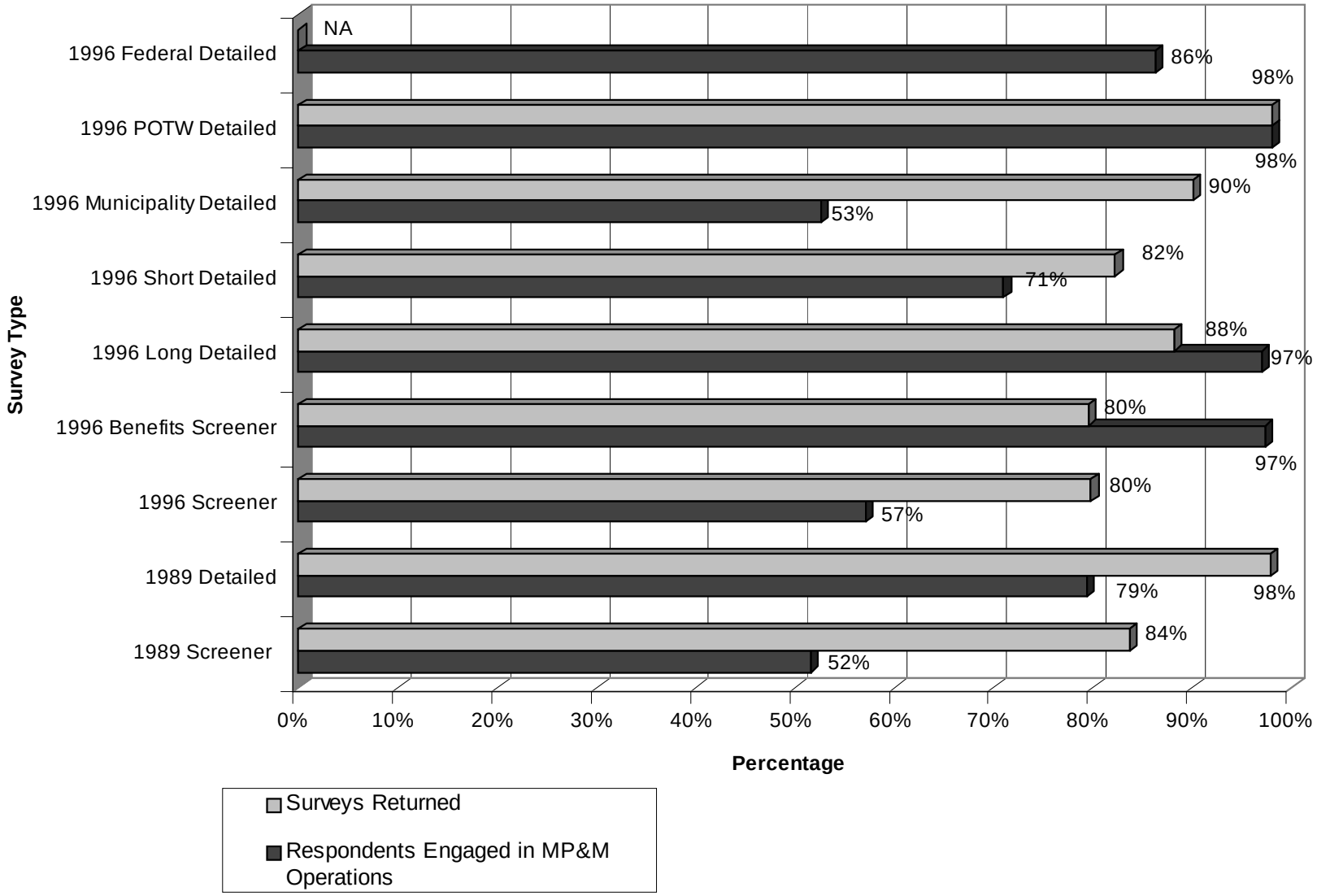
- Name and address of facility;
- Contact person;
- Parent company;
- Sectors in which the site manufactures, rebuilds, or maintains machines or metal components;
- SIC codes corresponding to products at the site;
- Number of employees;
- Annual revenues;

Table 3-1

1989 and 1996 MP&M Survey Mailout Results

Survey Type	Mailed	Returned Undelivered	Returned (%)	Not Returned (%)	Respondents Performing Proposed MP&M Operations (%)	Respondents Not Performing Proposed MP&M Operations and Respondents Performing only Dry Proposed MP&M Operations (%)
1989 Screener Survey	8,342	518	6,981[a] (84)	865 (11)	3,598 (52)	3,373 (48)
1989 Detailed Survey	1,020	0	998[b] (98)	22 (2)	792 (79)	199 (20)[e]
1996 Screener Survey	5,325	579	4,248[d] (80)	497 (10)	2,424 (57)	1,824 (43)
1996 Benefits Screener	1,750	155	1,392 (80)	161 (10)	1,354 (97)	38(3)
1996 Long Detailed Survey	353	1	311[b] (88)	41 (12)	303[c] (97)	8 (3)[e]
1996 Short Detailed Survey	101	1	83 (82)	17 (17)	59 (71)	24 (29)
1996 Municipality Detailed Survey	150	2	147 (98)	1 (1)	144 (53)[f]	3 (47)[f]
1996 Federal Detailed Survey	--	--	51 (--)	--	44 (86)	7 (14)

Source: 1989 and 1996 Survey Tracking Systems (see Section 8.8.1, DCN 16331, and Section 5.3, DCN 16330 of the rulemaking record).
[a]Includes 22 unsolicited responses.
[b]Seven of the 1989 detailed surveys and two of the 1996 long detailed surveys were returned too late to be incorporated into the detailed survey database.
[c]Includes long survey respondents that discharge <1 mgy.
[d]Does not include one duplicate survey received.
[e]Number of respondents also includes sites with classified process information (1989 detailed survey), sites with insufficient data (1996 long survey), and surveys returned too late to incorporate into the database (1996 long survey). The data from these surveys were not incorporated into the survey databases.
[f]For the municipality survey, these numbers represent the number and percentage of POTWs receiving wastewater from facilities evaluated in the final rule, and the number and percentage of POTWs not receiving wastewater from facilities evaluated in the final rule.
-- Not applicable to the survey.



NA - The number of federal surveys distributed is not certain, and the percentage of returned surveys cannot be calculated.

Figure 3-1. Percentage of 1989 and 1996 MP&M Surveys Returned and Percentage of Survey Respondents Performing Proposed MP&M Operations

- Unit operations performed at the site;
- Whether there is process water use and/or wastewater discharge for each unit operation performed at the site; and
- Base metal(s) on which each unit operation is performed.

The Agency used a computerized database system (MS Access 97) to store and analyze data received from the screeners. The database dictionary and all nonconfidential screener surveys are located in Section 5.3.7 of the rulemaking record.

EPA determined the number of sites engaged in proposed MP&M operations by responses to the screener. As shown in Table 3-1, approximately 52 percent of the 1989 screener survey respondents reported that their sites were engaged in proposed MP&M operations and approximately 48 percent reported no or only dry proposed MP&M operations at their sites. EPA could not determine the status of 10 of the sites because they returned incomplete screeners and did not respond to follow-up efforts.

The Agency contacted a statistically representative sample of the nonrespondent sites (i.e., sites that did not return the screener) and sites reporting "not engaged" in proposed MP&M operations to determine whether their responses were due to confusion over the scope of the industry. Based on the results of this follow-up, EPA adjusted the survey weights for misclassification and incorrect responses. The methodology for calculating the adjustment factors is provided in the Statistical Summary for the Metal Products & Machinery Industry Surveys (Section 10.0, DCN 16118).

1989 Screener Data Entry, Engineering Coding, and Analysis

EPA reviewed all of the screener surveys prior to data entry. As part of this effort, the Agency reviewed all documentation provided by the site, corrected errors and deficiencies, and coded the information for data entry. In some cases, these revisions required telephone contact with site personnel. The Agency contacted more than 1,100 screener recipients to resolve survey deficiencies and code information for data entry. Following preliminary review, EPA entered the scannable data (i.e., responses to multiple-choice, Mark Sense™ questions) into the database using a Scantron™ reader. EPA scanned each form twice and compared the information using a computer program as a quality control check. The Agency performed double key-entry of nonscannable data, resolved any inconsistencies, and converted the data to database files.

Based on the screener mailout results, EPA developed an industry profile for the seven sectors. The screener database report provides estimates of the national population for sites in these industrial sectors with regard to water use characteristics, size, location, sector, unit operations, and metal types. The Statistical Summary for the Metal Products & Machinery

Industry Surveys (Section 10.0, DCN 16118) discusses the sample size determination and statistical procedures for developing national estimates for the industry.

3.1.1.2 1989 Detailed Survey

Based on responses to the 1989 screener, EPA sent a more detailed survey to a select group of water-using facilities performing proposed MP&M operations. This survey, also referred to as the data collection portfolio (DCP), was designed to collect detailed technical and financial information reflecting a site's 1989 operations. EPA used this information to characterize these facilities from the seven industrial sectors, develop pollutant loadings and reductions, and develop compliance cost estimates, as discussed later in this document.

EPA mailed 896 detailed surveys in January 1991. Based on the number of detailed surveys returned undelivered, EPA mailed an additional 124 detailed surveys in January and February 1991, for a total of 1,020 detailed surveys mailed. A blank copy of the 1989 detailed survey (Section 3.7.2, DCN 17224) and copies of the nonconfidential portions of the completed detailed surveys are located in Section 5.3.8 of the rulemaking record.

1989 Detailed Survey Recipient Selection and Distribution

EPA selected 1,020 sites to receive detailed surveys from the following three groups of sites:

- Water-discharging 1989 screener respondents (860 sites);
- Water-using 1989 screener respondents that did not discharge process water (74 sites); and
- Water-discharging sites from key companies performing proposed MP&M operations that did not receive the 1989 screener (86 sites).

The methods used to select sites within each group are described below.

The Agency mailed the 1989 detailed survey to all 860 water-discharging screener respondents. EPA's intent in collecting detailed data from all 860 sites was to characterize the potential variations in unit operations performed and water-use practices among water-discharging sites in these seven industrial sectors.

The Agency mailed the 1989 detailed survey to a probability sample of 50 screener respondents that reported using but not discharging process water. EPA selected these sites to provide information on water-use practices at sites that use but do not discharge process water, and to determine if "zero-discharge" practices used at those sites could be used at other facilities performing proposed MP&M operations. In addition to the 50 probability sample sites, EPA mailed the 1989 detailed survey to 24 screener respondents that reported using but not

discharging process water. The Agency selected these sites because they performed unit operations that were not expected to be sufficiently characterized by detailed surveys mailed to other sites. The unit operations that EPA expected at each of the 24 sites are listed in Section 3.8.2 of the rulemaking record.

EPA mailed the 1989 detailed survey to 86 sites that did not receive the 1989 screener. The Agency identified these sites as representing key companies in the industry that EPA did not select as 1989 detailed survey recipients based on the screener mailout. EPA identified key companies from Dun & Bradstreet company lists, the Thomas Register, Fortune Magazine's list of the top 500 U.S. companies, and MP&M site visits at companies with annual revenues of $50 million or more that EPA believed to be leading companies in their particular industrial sector. The Agency contacted each of the key companies to identify sites within the company that were performing proposed MP&M operations and used process water to perform these operations. Records of these follow-up telephone calls are located in the MP&M rulemaking record (see Section 3.8.2). EPA did not use these 86 surveys for developing the national estimates because the Agency did not randomly select these facilities.

EPA operated a toll-free telephone helpline from January until July 1991 to assist recipients in completing the 1989 detailed survey. The helpline received approximately 1,400 calls from detailed survey recipients. Callers to the 1989 detailed survey helpline typically requested the following:

- Assistance with the technical sections of the detailed survey (e.g., technical clarification of unit operation definitions);
- Additional time to complete the survey;
- Assistance with the financial sections of the detailed survey (these calls were referred to a separate economics helpline); or
- Clarification of the applicability of the survey (i.e., did the survey apply to the site?).

Records for nonconfidential telephone calls to the helpline and to EPA personnel are located in Section 5.3.8 of the rulemaking record.

1989 Detailed Survey Mailout Results

Table 3-1 summarizes the results of the detailed survey mailout. Of the 1,020 sites that received the detailed survey, 998 responded to the survey and 22 did not. EPA did not include 199 of the 1,020 sites that responded in the detailed survey database for one of the following reasons:

- The site was out of business;

- The site did not use process water;
- The site was not performing proposed MP&M operations; or
- Process information at the site was Department of Defense or Department of Energy classified information.

Specific reasons for not using data from these sites are documented in Section 5.3.8.2 of the rulemaking record.

Upon review of the detailed surveys submitted by these sites, EPA determined 87 sites to be in the other 11 industrial sectors rather than the seven sectors identified in Section 3.1.1. Because the scope of the detailed survey mailout effort included only sites from the seven industrial sectors listed in Section 3.1.1, EPA did not include these 87 sites in the detailed survey database.

Information Collected

The Agency designed the 1989 detailed survey to collect information necessary to develop effluent limitations guidelines and standards for the MP&M rulemaking. EPA divided the detailed survey into the following parts:

- Part I - General Information;
- Part II - Process Information;
- Part III - Water Supply;
- Part IV - Wastewater Treatment and Discharge;
- Part V - Process and Hazardous Wastes; and
- Part VI - Financial and Economic Information.

The detailed survey instructions and the ICR for this project contain further details on the types of and potential uses for information collected. These documents are located in Section 3.7.2 of the rulemaking record, DCN 17224.

Part I (questions 1 through 13) requested information necessary to identify the site, to characterize the site by certain variables, and to confirm that the site was performing proposed MP&M operations. This information included: site name, address, contact person, number of employees, facility age, average energy usage, discharge permit status, and MP&M activity (manufacturing, rebuilding, or maintenance).

Part II (questions 14 through 21) requested detailed information on products, production levels, unit operations, activity, water use for unit operations, wastewater discharge from unit operations, miscellaneous wastewater sources, waste minimization practices (e.g., pollution prevention), and air pollution control for unit operations. EPA requested the site to provide detailed technical information (e.g., water balance, chemical additives, metal type

processed, disposition of wastewater) for each proposed MP&M operation and air pollution control device using process water. This section also requested information on unique and/or auxiliary operations. EPA used this information to evaluate raw waste characteristics, water use and discharge practices, and sources of pollutants for each proposed MP&M operation.

Part III (question 22) requested information on the water supply for the site. EPA requested the site to specify the source water origin, average intake flow, average intake operating hours, and the percentage of water used for proposed MP&M operations. EPA used this information to evaluate overall water use for the site.

Part IV (questions 23 through 33) requested detailed information on influent and effluent wastewater treatment streams and wastewater treatment operations. The information requested included: the origin of each stream contributing to the site's overall wastewater discharge; a block diagram of the wastewater treatment system; detailed technical information (e.g., wastewater stream flow rates, treatment chemical additives, system capacity, disposition of treatment sludge) for each wastewater treatment operation; self-monitoring data; and capital and operating cost data. EPA collected this information on facilities performing proposed MP&M operations to: (1) evaluate treatment in place at these facilities; (2) develop and design a cost model to estimate various control options; and (3) assess the long-term variability of effluent streams.

Part V (question 34) requested detailed information on the types, amounts, and composition of wastewater and solid/hazardous wastes generated during production or waste treatment, and the costs of solid waste disposal. EPA collected this information to evaluate the types and amounts of wastes currently discharged, the amount of waste that is contract hauled off site, and the cost of contract hauling wastes.

Part VI requested detailed financial and economic information from the site and the company owning the site. EPA collected this information to calculate the economic impacts of the regulatory options considered for the MP&M rulemaking.

1989 Detailed Survey Review, Coding, and Data Entry

The Agency completed an engineering review of the detailed surveys, including coding responses to questions from Parts I through V to facilitate entry of technical data into a database. The MP&M DCP Database Dictionary identifying all database codes developed for this effort and the database dictionary for Section VI of the detailed survey are located in Section 5.3.8.2 of the rulemaking record, DCN 17387.

The Agency followed up with telephone calls to all respondents who did not provide: (1) information on operations (manufacturing, rebuilding, or maintenance) or sectors; (2) metal type or unit operation descriptions for each water-using unit operation; or (3) descriptions for each wastewater treatment operation. EPA also made follow-up calls to

clarify incomplete or contradictory technical or economic information. EPA confirmed all information obtained from follow-up calls by sending a letter to the site.

EPA developed a database to store all technical data provided in the detailed surveys. After engineering review and coding, the Agency entered data from the detailed surveys into the database using a double key-entry and verification procedure. EPA coded and entered data from 792 detailed survey respondents determined to be performing proposed MP&M operations into the detailed survey database. The MP&M DCP Database Dictionary presents the database structure and defines each field in the detailed survey database and the codes that describe data in these fields.

The Economic, Environmental, and Benefits Analysis of the Proposed Metal Products and Machinery Rule, which is located in Section 8.1 of the rulemaking record, DCN 2000, discusses EPA's review of Section VI of the detailed survey.

1989 Detailed Survey Data Analysis

EPA used the information collected in the detailed survey to develop an industry profile and to identify the baseline of treatment in place and estimate the amount of pollutant discharges from facilities performing proposed MP&M operations. Section 4.0 of this document provides estimates of the national population of these facilities that discharge water with regard to size, location, sector, unit operations, metal types, and discharge flows, and discusses the statistical procedures for developing national estimates for the industry. Section 11.0 and 12.0 present the methodologies used to estimate pollutant discharges and compliance costs, respectively.

3.1.2 The 1996 Industry Surveys

Between 1996 and 1998, EPA distributed one screener and five detailed surveys, requesting data representing the survey recipients' 1996 operations. The five detailed surveys included the long, short, municipality, federal, and publicly owned treatment works (POTW) surveys. The Agency distributed the 1996 surveys to commercial and government (federal, state, and local) facilities that manufacture, rebuild, or maintain metal products or parts to be used in one of the following 11 industrial sectors:

- Bus and Truck;
- Household Equipment;
- Instruments;
- Job Shops;
- Motor Vehicles;
- Office Machines;
- Precious Metals and Jewelry;
- Printed Wire Boards;
- Railroad;

- Ships and Boats; and
- Miscellaneous Metal Products.

The 1996 screener and detailed surveys are discussed below. Recipient selection, stratification schemes, and the type and potential use of the information requested are described in more detail in the ICR for the 1996 screener (see Section 3.5.1, DCN 15766).

3.1.2.1 1996 Screener Survey

In December 1996 and February 1997, EPA distributed 5,325 screener surveys to sites believed to be engaged in manufacturing, rebuilding, or maintenance activities in one of the 11 industrial sectors listed in Section 3.1.2. The purpose of the screener surveys was to identify sites to receive the more detailed survey and to make a preliminary assessment of the industry for the 11 industrial sectors. EPA sent an additional 1,750 screeners to facilities located in Ohio (a state with a high concentration of facilities performing proposed MP&M operations) as part of a benefits study. The Agency used these screeners to collect data to analyze environmental benefits.

1996 Screener Recipient Selection and Distribution

As discussed above, EPA sent the 1996 screener survey to 5,325 randomly selected facilities performing proposed MP&M operations (includes replacement sites). The Agency selected potential recipients from the Dun & Bradstreet database based on the industrial sector (using the SIC code), activity (i.e., manufacturing, maintenance, or rebuilding), size as measured by number of employees, and wastewater discharge flow rate.

The Agency identified more than 126 SIC codes applicable to the 11 industrial sectors. Within each sector, EPA identified between 1 and 26 SIC codes. EPA calculated the number of sites to receive the 1996 screener within each SIC code by a coefficient of variation (CV) minimization procedure described in the Statistical Support Document located in Section 10.0 of the rulemaking record, DCN 16119. Based on the number of sites selected within each SIC code, the Agency obtained a list of randomly selected names and addresses from Dun & Bradstreet. This list included twice the number of sites specified by the CV minimization procedure for each SIC code. EPA randomly selected the initial list of sites from the Dun & Bradstreet database for each SIC code.

After reviewing the potential sites, EPA deleted sites for the following reasons:

- The site was a corporate headquarters without manufacturing, rebuilding, or maintenance operations;

- The site received a 1989 screener or detailed survey;

- The site was a duplicate of another facility in the list of potential facilities performing proposed MP&M operations;
- The site had an SIC code that was inconsistent with company name; or
- The site had an insufficient mailing address.

EPA established a toll-free telephone helpline and an electronic mail address to assist screener recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from more than 600 screener recipients. Nonconfidential notes from helpline and review follow-up calls are located in Section 5.3.1 of the rulemaking record.

1996 Screener Mailout Results

EPA initially mailed 4,900 surveys in December 1996. The Agency distributed surveys to an additional 425 sites to replace surveys that were returned undelivered. EPA assumed the undeliverable survey sites to be out of business. Of the 5,325 surveys mailed, 80 percent (4,248) of the recipients returned completed surveys to EPA. A blank copy of the 1996 screener (see Section 3.7.1, DCN 16367) and nonconfidential portions of the completed screeners are located in the public record for this rulemaking (see Section 5.3.1.1). Table 3-1 and Figure 3-1 summarize the MP&M survey mailout results.

The Agency contacted a statistically representative sample of nonrespondent sites to determine whether these sites were performing proposed MP&M operations and discharged process wastewater. Only 24 percent of the nonrespondents contacted were performing proposed MP&M operations, and approximately half of these facilities did not discharge process wastewater.

Information Collected

The Agency requested the following site-specific information in the screener:

- Name and address of facility;
- Contact person;
- Whether process water is used at the site;
- Destination of process wastewater discharged;
- Volume of process wastewater discharged;
- Number of employees;

- Annual revenue;
- Sectors in which the site manufactures, rebuilds, or maintains machines or metal components; and
- Unit operations performed at the site and whether there is water use and/or wastewater discharge for each unit operation performed at the site.

The Agency used a computerized database system (MS Access 97) to store and analyze data received from the 1996 screeners. Nonconfidential portions of the screener surveys (see Section 5.3.1.1) and the database dictionary are located in the public record for this rulemaking (see Section 5.3.1.2, DCN 15393).

1996 Screener Data Review and Data Entry

EPA reviewed the 1996 screener survey responses for accuracy and consistency and formatted the information for data entry. The Agency contacted approximately 1,800 screener respondents to resolve deficient and inconsistent information prior to data entry. Following review, EPA double key entered and compared the data from the formatted screeners, using a computer program, as a quality control check. The Agency then reviewed the database files for deficiencies and inconsistencies, and resolved all issues for the final survey database.

1996 Benefits Screener Survey

For an environmental benefits study, EPA sent the 1996 screener survey to 1,750 (including replacement sites) randomly selected sites in Ohio, a state with a large number of facilities performing proposed MP&M operations. The selection criteria and sampling frame for the benefits screener recipients are described in more detail in memoranda located in Section 3.8.1.7 of the rulemaking record, DCN 16333.

The Agency initially mailed the benefits screener to 1,600 facilities in October 1998. EPA mailed screeners to an additional 150 facilities in February 1999 to replace surveys that were returned undelivered. The Agency assumed the undeliverable survey sites to be out of business. Of the 1,750 surveys mailed, 80 percent (1,392) of the recipients returned completed screeners to EPA. A blank copy of the 1996 benefits screener (see Section 3.7.1, DCN 16367) and nonconfidential portions of the completed benefits screeners (see Section 8.8.1) are located in the public record for this rulemaking. Table 3-1 and Figure 3-1 summarize the MP&M mailout results.

EPA established a toll-free telephone helpline and an electronic mail address to assist screener recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from more than 900 benefits screener recipients. Nonconfidential notes from helpline and review follow-up calls are located in Section 8.8.1 of the public record for this rulemaking.

The Agency followed the same review, data entry, and database development procedures used for the original 1996 screener survey. EPA contacted more than 400 screener respondents to resolve deficient and inconsistent information prior to data entry. The benefits screener database is discussed in the Economic, Environmental, and Benefits Analysis of the Proposed Metal Products and Machinery Rule.

3.1.2.2 1996 Long Detailed Survey

EPA distributed the long detailed surveys (long survey) in June 1997 to 353 wastewater-discharging facilities performing proposed MP&M operations. EPA designed this survey to gather detailed technical and economic information required to develop the MP&M effluent limitations guidelines and standards. The long survey is discussed below.

1996 Long Survey Recipient Selection and Distribution

In June 1997, EPA sent the long survey to all 353 1996 screener respondents who indicated they performed operations in one of the 11 industry sectors listed in Section 3.1.2 and discharged one million or more gallons of MP&M process wastewater annually. EPA established a toll-free telephone helpline and an electronic mail address to assist long survey recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from approximately 200 long survey recipients. Nonconfidential notes from helpline and review follow-up calls are located in Section 5.3.2.1 of the public record for this rulemaking.

1996 Long Survey Mailout Results

Of the 353 surveys mailed, 88 percent (311) of the recipients returned completed surveys to EPA. One survey was returned as undelivered and EPA assumed the facility to be out of business. A blank copy of the 1996 long survey (Section 3.7.1, DCN 713) and nonconfidential portions of the completed long surveys are located in Section 5.3.2.1 of the public record for this rulemaking. Table 3-1 and Figure 3-1 summarize the MP&M survey mailout results.

Information Collected

EPA divided the long detailed survey into the following sections:

- Section I: General Site Information;
- Section II: General Process Information;
- Section III: Specific Process Information;

- Section IV: Economic Information; and
- Section V: Voluntary Supplemental Information.

Table 3-2 summarizes the information requested in the 1996 long, short, federal, and municipality detailed surveys by question number. EPA designed these surveys to collect similar detailed process information from different audiences, as discussed below for each survey. Further details on the types of information collected and the potential uses of the information are contained in the ICR for this data collection (see Section 3.5.1, DCN 15766) and in the survey instructions that are located in Section 3.7.1 of the rulemaking record, DCN 713.

Section I requested information to determine if the facility was performing proposed MP&M operations. Question 1 requested the site to identify the industry sector and type of activity (manufacturing, rebuilding, or maintenance) performed.

Section II requested information to identify the site location and contact person, number of employees, facility age, process wastewater discharge status and destination, and wastewater discharge permits and permitting authority. This section also requested general information about metal types processed, products and production levels, water use for unit operations, and wastewater discharge from unit operations. EPA used the process information to evaluate water use and discharge practices and sources of pollutants for each proposed MP&M operation.

Section III requested detailed information on wet proposed MP&M operations, pollution prevention practices, wastewater treatment technologies, costs for water use and wastewater treatment systems, and wastewater/sludge disposal costs. EPA also requested the site to provide block diagrams of the production process and the wastewater treatment system. The unit operation information requested included: metal types processed, production rate, operating schedule, chemical additives, volume and destination of process wastewater and rinse waters, in-process pollution prevention technologies, and in-process flow control technologies. The information requested for each wastewater treatment unit included: operating flow rate, design capacity, operating time, chemical additives, and unit operations discharging to each treatment unit. In addition, EPA requested the site to provide the type of any wastewater sampling data collected. EPA used these data to characterize the industry, to perform subcategorization analyses, to identify best management practices, to evaluate performance of the treatment technology for inclusion in the regulatory options, and to develop regulatory compliance cost estimates.

Section IV requested detailed financial and economic information about the site or the company owning the site. EPA collected this information to calculate the economic impacts of the regulatory options considered for the MP&M rulemaking.

Section V requested supplemental information on other facilities performing proposed MP&M operations owned by the company. EPA included this voluntary section to

measure the combined impact of proposed MP&M effluent guidelines on companies with multiple facilities

Table 3-2

Summary of 1996 Detailed Survey Information by Question Number

Survey Question Number			Type of Information Requested
Long and Federal	**Short**	**Municipality**	
Section I 1	**Section I** 1	**Part II** 1	Industrial sector activities
Section II 2-5	**Section II** 2-5	2-5	Site location and facility contact
6, 7	6, 7	5, 6	Number of employees and age of site
8, 9	8, 9	7, 8	Discharge status and destination
10	10	9	Permits under miscellaneous categorical effluent guidelines
---	11-12	10-11	Types of end-of-pipe wastewater treatment units
11	13	12	Metal types processed
12	15	13	5 major products (quantity and sector)
13	16	14	Unit operations: water use and associated rinses
Section III 14-15	---	---	General water use and costs
16	---	---	Production process diagram
17-23	---	---	Detailed description of **wet** unit operations performed
24-29	**Section II** 17	16	In-process pollution prevention technologies or practices
30	---	---	Wastewater treatment (WWT) diagram
31-41	---	---	Detailed design and operating parameters of WWT units
42	---	---	WWT costs by treatment unit
43-44	**Section II** 14	15	Wastewater sampling and analysis conducted
45	---	---	Contract haul and disposal costs
---	---	---	Facility comments page
Section IV 1-9	**Section IV** 1-8	**Part I** 1-3	Financial and economic data
Section V 1	**Section V** 1	---	Parent firm name and contact, number of other facilities performing proposed MP&M operations
2	2	---	Number of employees for other facility(ies)
3	3	---	Industrial and activity
2, 4	2, 4	---	Discharge status and destination
5	5	---	Unit operations: water use and discharge status

--- Question is not applicable to this survey.

performing proposed MP&M operations that discharge process wastewater. This section requested the same information collected in the 1996 MP&M screener survey. Responses to questions in this section provided the size, industrial sector, revenue, unit operations, and water usage of the company's other facilities performing proposed MP&M operations.

1996 Long Survey Data Review and Data Entry

EPA completed a detailed engineering review of Sections I through III of the detailed long survey to evaluate the accuracy of technical information provided by the respondents. During the engineering review, EPA coded responses to facilitate entry of technical data into the long survey database. The MP&M 1996 Long Survey Database Dictionary identifies the database codes developed for this project, and is located in Section 5.3.2.2 of the rulemaking record, DCN 15773. EPA contacted approximately 240 long survey respondents, by telephone and letter, to clarify incomplete or inconsistent technical information prior to data entry.

The Agency developed a database for the technical information provided by survey respondents. After engineering review and coding, EPA entered data from 303 long surveys into the database using a double key-entry and verification procedure. The MP&M 1996 Long Survey Database Dictionary presents the database structure and defines each field in the database files. EPA did not include data from 8 long survey respondents in the database for the following reasons:

- The site was out of business;
- The site did not use process water;
- The site was not performing proposed MP&M operations; or
- The site provided insufficient data and the survey was returned too late to enter into the database.

The Economic, Environmental, and Benefits Analysis of the Proposed Metal Products and Machinery Rule, which is located in Section 8.1 of the rulemaking record, DCN 2000, discusses EPA's review of Section IV of the detailed survey.

3.1.2.3 1996 Short Detailed Survey

EPA distributed the short detailed survey (short survey) in September 1997 to 101 wastewater-discharging facilities performing proposed MP&M operations. EPA designed this survey to gather additional technical and economic information required to develop the MP&M effluent limitations guidelines and standards. The short survey is discussed below.

1996 Short Survey Recipient Selection and Distribution

EPA initially sent 100 short surveys in September 1997 and mailed one additional survey to a site to replace a short survey that was returned undelivered. EPA assumed the undeliverable site to be out of business. The Agency sent the short surveys to randomly selected 1996 screener respondents who performed operations in one of the 11 industry sectors identified in Section 3.1.2 and indicated they discharged less than one million gallons of MP&M process wastewater annually. The selection criteria and sampling frame for short survey recipients are described in more detail in the Statistical Summary for the Metal Products & Machinery Industry Surveys (Section 10.0, DCN 16118).

EPA established a toll-free telephone helpline and an electronic mail address to assist short survey recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from approximately 20 short survey recipients. Nonconfidential notes from helpline and review follow-up calls are located in Section 5.3.3.1 of the public record for this rulemaking.

1996 Short Survey Mailout Results

Of the 101 surveys mailed, 82 percent (83 surveys) of the recipients returned completed surveys to EPA. A blank copy of the 1996 short survey (Section 3.7.1, DCN 16368) and nonconfidential portions of the completed short surveys (Section 5.3.3.1) are located in the public record for this rulemaking. Table 3-1 and Figure 3-1 summarize the MP&M survey mailout results.

Information Collected

The information collected in the 1996 short survey included the identical general site and process information and economic information collected in Sections I, II, IV, and V of the long detailed survey (see Section 3.1.2.2). To minimize the burden on facilities discharging less than one million gallons of process wastewater, EPA did not require these facilities to provide the detailed information on proposed MP&M operations or treatment technologies that EPA requested in Section III of the long survey. The ICR for this data collection and the survey instructions contain further details on the types of information collected and the potential uses of the information.

EPA divided the short survey into the following sections:

- Section I: General Site Information;
- Section II: General Process Information;
- Section IV: Economic Information; and
- Section V: Voluntary Supplemental Information.

Section III, Specific Process Information, consisted of a statement that EPA was not requesting this information to reduce burden on sites discharging less than one million gallons of process wastewater per year. Table 3-2 summarizes the 1996 short survey information by question number.

1996 Short Survey Data Review and Data Entry

EPA completed a detailed engineering review of Sections I and II of the short survey to evaluate the accuracy of technical information provided by the respondents. During the engineering review, EPA coded responses to facilitate entry of technical data into the short survey database. The MP&M 1996 Short Survey Database Dictionary identifies the database codes developed for this project and is located in Section 5.3.3.2 of the rulemaking record, DCN 15772. EPA contacted more than 60 short survey respondents, by telephone and letter, to clarify incomplete or inconsistent technical information prior to data entry.

The Agency developed a database for the technical information provided by survey respondents. After engineering review and coding, EPA entered data for 75 short surveys into the database using a double key-entry and verification procedure. The MP&M 1996 Short Survey Database Dictionary presents the database structure and defines each field in the database files. EPA did not include data from eight short survey respondents in the database for the following reasons:

- The site was out of business;
- The site did not use process water; or
- The site was not performing proposed MP&M operations.

The Economic, Environmental, and Benefits Analysis of the Proposed Metal Products and Machinery Rule, which is located in Section 8.1 of the rulemaking record, DCN 2000, discusses EPA's review of Section IV of the short survey.

3.1.2.4 1996 Municipality Detailed Survey

EPA distributed the municipality surveys in June 1997 to 150 city and county facilities that might operate facilities performing proposed MP&M operations. EPA designed this survey to measure the impact of this rule on municipalities and other government entities that perform certain maintenance and rebuilding operations (e.g., bus and truck, automobiles).

Recipient Selection and Distribution

The Agency sent the municipality survey to 150 city and county facilities randomly selected from the Municipality Year Book-1995 based on population and geographic location. EPA allocated 60 percent of the sample to municipalities and 40 percent to counties. The 60/40 distribution was approximately proportional to their aggregate populations in the frame. The Agency divided the municipality sample and the county sample into three size

groupings as measured by population. For municipalities, the population groupings were: less than 10,000 residents, 10,000 - 50,000 residents, and 50,000 or more residents. For counties, the population groupings were: less than 50,000 residents, 50,000 - 150,000 residents, and 150,000 or more residents. The geographic stratification conformed to the Census definitions of Northeast, North Central, South, Pacific, and Mountain states.

EPA established a toll-free telephone helpline and an electronic mail address to assist municipality survey recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from more than 50 municipality survey recipients. Notes from helpline and review follow-up calls are located in Section 5.3.4.1 of the rulemaking record.

1996 Municipality Survey Mailout Results

Of the 150 municipality surveys mailed, three surveys were returned undelivered and 135 surveys (90 percent) of the recipients returned completed surveys to EPA. A blank copy of the 1996 municipality survey (Section 3.7.1, DCN 16366) and nonconfidential portions of the completed municipality surveys (Section 5.3.4.1) are located in the public record for this rulemaking. Table 3-1 and Figure 3-1 summarize the MP&M survey mailout results.

Information Collected

The 1996 municipality survey collected economic information for the entire municipality and site-specific process information for each facility performing proposed MP&M operations operated by the municipality.

EPA divided the municipality detailed survey into the following parts:

- Part I: Economic and Financial Information; and
- Part II: General Site-Specific Process Information.

Table 3-2 summarizes the 1996 municipality survey information by question number. The ICR for this data collection (Section 3.5.1, DCN 15766) and the survey instructions (Section 3.7.1, DCN 15366) contain further details on the types of information collected and the potential uses of the information and are located in the rulemaking record.

Part I requested information on the site location and contact person, number of employees, detailed financial and economic information about the entire municipality, and information necessary to determine if the municipality owned and operated facilities performing proposed MP&M operations in any of the proposed industrial sectors.

Part II requested site-specific process information for each facility performing proposed MP&M operations owned and operated by the municipality. Question 1 requested the site to identify the industry sector and type of activity (manufacturing, rebuilding, or maintenance) performed. The remaining questions were identical to Section II of the short

detailed survey and requested facility age, process wastewater discharge status and destination, wastewater discharge permits and permitting authority, general information about metal types processed, products and production levels, water use for unit operations, and wastewater discharge from unit operations. The Agency used the process information to evaluate water use and discharge practices and sources of pollutants for each proposed MP&M operation.

1996 Municipality Survey Data Review and Data Entry

EPA completed a detailed engineering review of Part II of the municipality survey to evaluate the accuracy of technical information provided by the respondents. During the engineering review, the Agency coded responses to facilitate entry of technical data into the municipality survey database. The MP&M 1996 Municipality Survey Database Dictionary identifies the database codes developed for this project, and is located in Section 5.3.4.2 of the rulemaking record, DCN 15771. EPA contacted more than 50 municipality survey respondents by telephone to clarify incomplete or inconsistent technical information prior to data entry.

The Agency developed a database for the technical information provided by survey respondents. After engineering review and coding, EPA entered data from 209 municipality facilities into the database using a double key-entry and verification procedure. This number is greater than the number of respondents because some municipalities had more than one facility performing proposed MP&M operations. The MP&M 1996 Municipality Survey Database Dictionary presents the database structure and defines each field in the database files.

The Economic, Environmental, and Benefits Analysis of the Proposed Metal Products and Machinery Rule, which is located in Section 8.1 of the rulemaking record, DCN 2000, discusses EPA's review of Part I of the municipality survey.

3.1.2.5 1996 Federal Facilities Detailed Survey

In April 1998, EPA distributed the federal facilities detailed survey (federal survey) to the following seven federal agencies:

- Department of Energy;
- Department of Defense;
- National Aeronautics and Space Administration (NASA);
- Department of Transportation (including the United States Coast Guard);
- Department of Interior;
- Department of Agriculture; and
- United States Postal Service.

EPA used this survey to assess the impact of the MP&M effluent limitations guidelines and standards on federal agencies that operate facilities performing proposed MP&M operations.

Recipient Selection and Distribution

There was no specific sampling frame for the federal survey. EPA distributed the survey to federal agencies likely to perform industrial operations on metal products or machinery. EPA requested representatives of seven federal agencies to voluntarily distribute copies of the survey to sites they believed performed proposed MP&M operations. The selection criteria for federal survey recipients are described in more detail in the ICR for the 1996 MP&M industry surveys. Because the sample was not randomly selected, EPA did not use data from these surveys to develop national estimates.

EPA established a toll-free telephone helpline and an electronic mail address to assist federal survey recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from approximately 20 federal survey recipients. Nonconfidential notes from helpline and review follow-up calls are located in Section 5.3.5.1 of the public record for this rulemaking.

1996 Federal Survey Distribution Results

The Agency received 51 completed federal surveys, 39 from Department of Defense facilities and 12 from NASA facilities. A blank copy of the 1996 federal survey (Section 3.7.1, DCN 721) and nonconfidential portions of the completed federal surveys are located in Section 5.3.5.1 of the public record for this rulemaking.

Information Collected

The information requested in Sections I and III of the 1996 federal survey was identical to the long survey (see Section 3.1.2.2). The financial and economic questions in Section IV were revised to obtain this information for only the MP&M activities on a federal site. The ICR for this data collection and the survey instructions contain further details on the types of information collected and the potential uses of the information. Table 3-2 summarizes the 1996 federal detailed survey information by question number.

Data Review and Data Entry

EPA completed a detailed engineering review of Sections I through III of the federal survey to evaluate the accuracy of technical information provided by the respondents. During the engineering review, the Agency coded responses to facilitate entry of technical data into the federal survey database. The MP&M 1996 Federal Survey Database Dictionary identifies the database codes developed for this project and is located in Section 5.3.5.2 of the rulemaking record, DCN 15991.

The Agency developed a database for the technical information provided by survey respondents. After engineering review and coding, EPA entered data from 44 federal surveys into the database using a double key-entry and verification procedure. The Agency did

not include data from seven federal survey responses in the database because the sites did not use MP&M process water. The MP&M 1996 Federal Survey Database Dictionary presents the database structure and defines each field in the database files.

The Economic, Environmental, and Benefits Analysis of the Proposed Metal Products and Machinery Rule, which is located in Section 8.1 of the rulemaking record, DCN 2000, discusses EPA's review of Section IV of the federal survey.

3.1.2.6 1996 POTW Detailed Survey

EPA distributed the POTW survey to 150 sites in November 1997. The Agency designed this survey to evaluate benefits associated with the MP&M regulations and to estimate possible costs and burden that POTWs might incur in writing and maintaining MP&M permits or other control mechanisms.

Recipient Selection and Distribution

The Agency sent the POTW survey to 150 POTWs with flow rates greater than 0.50 million gallons per day. EPA randomly selected the recipients from the 1992 Needs Survey Review, Update, and Query System Database. EPA divided the POTW sample into two strata by daily flow rates: 0.50 to 2.50 million gallons, and 2.50 million gallons or more. The selection criteria and sampling frame for POTW survey recipients are described in more detail in the ICR for the 1996 surveys.

EPA established a toll-free telephone helpline and an electronic mail address to assist POTW survey recipients in completing the survey. EPA received helpline calls and electronic mail inquiries from approximately 50 POTW survey respondents. Nonconfidential notes from helpline and review follow-up calls are located in Section 8.7 of the public record for this rulemaking.

1996 POTW Survey Mailout Results

Of the 150 POTW surveys mailed, two surveys were returned undelivered and 98 percent (147) of the recipients returned completed surveys to EPA. A blank copy of the 1996 POTW survey (Section 3.7.1, DCN 16369) and nonconfidential portions of the completed POTW survey (Section 8.7) are located in the public record for this rulemaking. Table 3-1 and Figure 3-1 summarize the MP&M survey mailout results.

Information Collected

The POTW survey requested data required to estimate benefits and costs associated with implementation of the MP&M regulations. The ICR for this data collection and the survey instructions contain further details on the types of information collected and the potential uses of the information. EPA divided the POTW survey into the following parts:

- Part I: Introduction and Basic Information;
- Part II: Administrative Permitting Costs; and
- Part III: Sewage Sludge Use or Disposal Costs.

Part I requested site location and contact information and the total volume of wastewater treated at the site. EPA used the wastewater flow information to characterize the size of the POTW.

Part II requested the number of industrial permits written, the cost to write the permits, the permitting fee structure, the percentage of industrial dischargers covered by National Categorical Standards (i.e., effluent guidelines), and the percentage of permits requiring expensive administrative activities. EPA used this information to estimate administrative burden and costs.

Part III requested information on the use or disposal of sewage sludge generated by the POTW. EPA required only POTWs that received discharges from facilities performing proposed MP&M operations to complete Part III. The sewage sludge information requested included the amount generated, use or disposal method, metal levels, use or disposal costs, and the percentage of total metal loadings at the POTW from facilities performing proposed MP&M operations. The Agency used this information to assess the potential changes in sludge handling resulting from the MP&M rule and to estimate economic benefits to the POTW related to sludge disposal and reduction in upsets/interference.

Data Review and Data Entry

EPA performed a detailed review of the POTW survey to evaluate the accuracy of information provided by the respondents. During the review, the Agency coded responses to facilitate entry of data into the POTW survey database. The database dictionary for the POTW survey identifies the database codes developed for this project, and is located in Section 8.7 of the rulemaking record. EPA contacted more than 95 POTW survey respondents by telephone to clarify incomplete or inconsistent information prior to data entry.

The Agency developed a database for the information provided by survey respondents. After review and coding, EPA entered data from 147 POTW surveys into the database using a double key-entry and verification procedure. The database dictionary presents the database structure and defines each field in the database files.

3.1.3 1997 Iron and Steel Industry Survey Data

As part of its effort to review and revise effluent limitations guidelines and standards for the Iron and Steel Point Source Category (40 CFR 420), EPA distributed, reviewed, and coded the iron and steel industry detailed and short surveys of 402 iron and steel facilities in November 1998.

EPA included data from 154 iron and steel surveys in the MP&M survey database. EPA used these 154 Iron & Steel surveys to create a new subcategory, Steel Forming and Finishing, in the January 2001 proposal. Based on comments to the January 2001 proposal and June 2002 NODA, EPA concluded that those operations included in the proposed Steel Forming and Finishing Subcategory of the MP&M Point Source Category should remain subject to the effluent guidelines and standards at the Iron and Steel Point Source Category (40 CFR 420). See Section 6.0 for further discussion of subcategorization.

As discussed in the June 2002 NODA (67 FR 38752), EPA considered establishing a segment of the Steel Forming and Finishing Subcategory for discharges resulting from continuous electroplating of flat steel products (e.g., strip, sheet, and plate). EPA examined its database for facilities that perform continuous steel electroplating and found that continuous electroplaters do not perform operations similar to facilities in the proposed Steel Forming and Finishing Subcategory. Rather, continuous electroplaters perform operations included in the proposed General Metals Subcategory. Therefore, in evaluating options for the final rule, EPA included continuous electroplaters in the proposed General Metals Subcategory. See Section 6.0 for a detailed discussion of subcategorization. For this reason, EPA incorporated the information on these operations reported in 24 iron and steel surveys into the MP&M database. Operations on the continuous electroplating lines may include:

- Acid cleaning;
- Alkaline cleaning;
- Conversion coating (e.g., passivation, surface activation/fluxing);
- Electroplating;
- Rinsing; and
- Sealing.

All 24 sites with electroplating lines processing steel flat-rolled products discharge process wastewater. The Agency coded and entered process and wastewater treatment information from the 47 lines in the 24 iron and steel surveys into the MP&M cost model. A blank copy of the 1997 iron and steel detailed and short surveys and nonconfidential portions of the 24 completed iron and steel surveys are located in Sections 5.3.6 and 15.1 of the public record for this rulemaking. As discussed in Section 9.0, EPA rejected establishing limitations and standards for the proposed General Metals Subcategory. Continuous electroplaters remain subject to the Metal Finishing Point Source Category (40 CFR 433), as applicable.

1997 Iron and Steel Survey Recipient Selection and Distribution

The Agency consulted with industry trade associations and visited a number of sites to develop the survey instruments and to ensure an accurate mailing list.

EPA distributed four industry surveys:

- U.S. EPA Collection of 1997 Iron and Steel Industry Data (detailed survey);
- U.S. EPA Collection of 1997 Iron and Steel Industry Data (Short Form) (short survey);
- U.S. EPA Collection of Iron and Steel Industry Wastewater Treatment Capital Cost Data (cost survey); and
- U.S. EPA Analytical and Production Data Follow-Up to the Collection of 1997 Iron and Steel Industry Data (analytical and production survey).

In October 1998, EPA mailed the detailed survey to 176 iron and steel sites and the short survey to 223 iron and steel sites. EPA designed the detailed survey for those iron and steel sites that perform any iron and steel manufacturing process. Those sites include integrated and non-integrated steel mills, as well as sites that were initially identified as stand-alone cokemaking plants, stand-alone sinter plants, stand-alone direct-reduced ironmaking plants, stand-alone hot forming mills, and stand-alone finishing mills. The short survey is an abbreviated version of the detailed survey. It was designed for stand-alone iron and steel sites with the exceptions of those that received the detailed survey. EPA mailed the cost survey and the analytical and production survey to subsets of the facilities that received the detailed or short survey to obtain more detailed information on wastewater treatment system costs, analytical data, and facility production. EPA mailed the cost survey to 90 iron and steel sites and the analytical and production survey to 38 iron and steel sites.

EPA mailed the iron and steel industry surveys by mail to facilities that were identified from the following sources:

- Association of Iron and Steel Engineers' 1997 and 1998 Directories: Iron and Steel Plants Volume 1, Plants and Facilities;
- Iron and Steel Works of the World (11th and 12th editions) directories;
- Iron and Steel Society's The Steel Industry of Canada, Mexico, and the United States: Plant Locations;
- Member lists from the following trade associations:
  - American Coke and Coal Chemicals Institute,
  - American Galvanizers Association,
  - American Iron and Steel Institute,
  - American Wire Producers Association,
  - Cold Finished Steel Bar Institute,

  - Specialty Steel Industry of North America,
  - Steel Manufacturers Association,
  - Steel Tube Institute of North America, and
  - Wire Association International;

- Dun & Bradstreet Facility Index Database;
- EPA's Permit Compliance System (PCS) Database;
- EPA's Toxic Release Inventory (TRI) Database;
- Iron and Steel Society's Iron and Steelmaker "Roundup" editions;
- 33 Metalproducing "Roundup" editions (Reference 3-22);
- 33 Metalproducing "Census of the North American Steel Industry"; and
- Thomas Register.

The Agency cross-referenced these sources with one another to develop a list of individual sites. Based on these sources, EPA identified 822 candidate facilities to receive surveys. To minimize the burden on the respondents, EPA grouped facilities into 12 strata. In general, EPA determined the strata based on its understanding of the manufacturing processes at each facility.

Depending on the amount or type of information EPA required for the rulemaking, EPA either solicited information from all facilities within a stratum (i.e., a census or "certainty" stratum) or selected a random sample of facilities within a stratum (i.e., statistically sampled stratum). EPA sent a survey to all facilities in the certainty strata (strata 5 and 8) because the Agency determined it was necessary to capture the size, complexity, or uniqueness of the steel operations at these sites. EPA also sent surveys to all facilities in strata 1 through 4 (all cokemaking sites, integrated steelmaking sites, and sintering and direct-reduced ironmaking sites) because of the relatively low number of sites in each stratum and because of the size, complexity, and uniqueness of raw material preparation and steel manufacturing operations at these sites. The Agency statistically sampled the remaining sites in strata 6, 7, and 9 through 12. EPA calculated survey weights for each selected facility based on the facility's probability of selection. If the Agency sent a survey to every facility in a stratum, each selected facility represents only itself and has a survey weight of one. For statistically sampled strata, each selected facility represents itself and other facilities within that stratum that were not selected to receive an industry survey. These facilities have survey weights greater than one. See the Development Document for Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (EPA-821-R-02-004) for more details.

Of the 822 candidate facilities, EPA mailed either a detailed survey or a short survey to 399 facilities.[2] Detailed survey recipients included integrated mills, non-integrated mills, stand-alone cokemaking sites, stand-alone sintering sites, stand-alone direct-reduced ironmaking sites, stand-alone hot forming sites, and stand-alone finishing sites. Short survey recipients included stand-alone cold forming sites, stand-alone pipe and tube sites, stand-alone hot dip coating sites, and stand-alone wire sites.

Once the Agency completed a review of the detailed and short surveys and defined the technology options, EPA identified survey respondents who had installed wastewater treatment systems in the last 10 years (since 1990) that were similar to the technology options and mailed them the cost survey. EPA selected 38 facilities to receive the analytical and production survey who had indicated in the detailed or short survey that: (1) they had treatment trains similar to the treatment technology options, (2) they had collected analytical data for that treatment train, (3) they had a treatment train with a dedicated outfall from which EPA could evaluate performance, and (4) they did not add excessive dilution water to the outfall before sampling.

1997 Iron and Steel Survey Information Collected

The detailed and short surveys were divided into two parts: Part A: Technical Information and Part B: Financial and Economic Information. The "Part A" technical questions in the detailed survey comprised four sections, with Sections 3 and 4 being combined in the short survey, as follows:

- Section 1: General Site Information;
- Section 2: Manufacturing Process Information;
- Section 3: In-Process and End-of-Pipe Wastewater Treatment and Pollution Prevention Information; and
- Section 4: Wastewater Outfall Information.

The financial and economic information in Part B of the detailed survey also comprised four sections, as shown below:

- Section 1: Site Identification;
- Section 2: Site Financial Information;
- Section 3: Business Entity Financial Information; and

[2]Before the surveys were actually mailed, the Agency notified potential survey recipients. One site, randomly selected from stratum 12 and notified that it would be receiving a survey, notified the Agency that it was not engaged in iron and steel activities. The Agency decided not to mail a survey to that site. Therefore, this site was not included in the 399 facilities receiving surveys.

- Section 4: Corporate Parent Financial Information.

Part B of the short survey contained a single section for site identification and financial information. More detailed descriptions of financial data collection and analysis are included in the Economic Analysis of Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (EPA 821-R-02-006).

The detailed survey requested detailed descriptions of all manufacturing processes and treatment systems on site. The short survey contained manufacturing process questions for only forming and finishing operations. EPA eliminated the cokemaking, ironmaking, and steelmaking questions from the short survey because those processes were not applicable to the facilities that received the short survey. The Agency also reduced the amount of detail requested in the short survey. EPA used the detailed descriptions of hot forming mills from the integrated, non-integrated, and stand-alone hot forming mills to make assumptions about industry trends.

Part A Section 1 requested site contacts and addresses and general information regarding manufacturing operations, age, and location. The Agency used this information to develop the proposed subcategorization and applicability statements.

Part A Section 2 requested information on products, types of steel produced, production levels, unit operations, chemicals and coatings used, quantity of wastewater discharged from unit operations, miscellaneous wastewater sources, flow rates, pollution prevention activities, and air pollution control. The Agency used these data to evaluate manufacturing processes and wastewater generation, to develop the model production-normalized flow rates, and to develop regulatory options. EPA also used these data to develop the proposed subcategorization and applicability and to estimate compliance costs and pollutant removals associated with the regulatory options EPA considered for the final rule.

Part A Section 3 requested detailed information (including diagrams) on the wastewater treatment systems and discharge flow rates, monitoring analytical data, and operating and maintenance cost data (including treatment chemical usage). The Agency used these data to identify treatment technologies in place, to determine regulatory options, and to estimate compliance costs and pollutant removals associated with the regulatory options considered for the final rule.

Part A Section 4 requested permit information, discharge locations, wastewater sources to each outfall, flow rates, regulated pollutants and limits, and permit monitoring data. EPA used this information to calculate baseline or current loadings for each facility. The Agency also used this information to calculate the pollutant loadings associated with the regulatory options considered for the final rule.

The cost survey requested detailed capital cost data on selected wastewater treatment systems installed since 1993, including equipment, engineering design, and installation costs. (EPA chose 1993 because 1997 was the base year for the detailed and short surveys, and

this provided the Agency with a five-year range for collecting cost data on recently installed treatment systems.) EPA incorporated these data into a costing methodology and used them to determine incremental investment costs and incremental operating and maintenance costs associated with the regulatory options considered for the final rule.

The analytical and production survey requested detailed daily analytical and flow rate data for selected sampling points, and monthly production data and operating hours for selected manufacturing operations. The Agency used the analytical data collected to estimate baseline pollutant loadings and pollutant removals from facilities with treatment in place similar to the technology options considered for the final rule, to evaluate the variability associated with iron and steel industry discharges, and to establish effluent limitations guidelines and standards. The Agency used the production data collected to evaluate the production basis for applying the proposal in National Pollutant Discharge Elimination System (NPDES) permits and pretreatment control mechanisms.

1997 Iron and Steel Surveys Data Review and Data Entry

EPA completed a detailed engineering review of the detailed surveys to evaluate the accuracy of technical information provided by the respondents. During the engineering review, EPA coded responses to facilitate entry of technical data into the survey database. EPA contacted survey respondents, by telephone and letter, to clarify incomplete or inconsistent technical information prior to data entry.

The Agency developed a database for the technical information provided by survey respondents. After engineering review and coding, EPA entered data from the surveys into the database using a double key-entry and verification procedure. During the engineering review, EPA coded responses to facilitate entry of technical data into the survey database.

3.1.4 Data Submitted by the American Association of Railroads (AAR)

As noted in the June 2002 NODA (67 FR 38752), EPA conducted another review of all railroad line maintenance (RRLM) facilities in the MP&M questionnaire database to determine the destination of discharged wastewater (i.e., either directly to surface waters or indirectly to POTWs or both) and the applicability of the final rule to discharged wastewaters. As a result of this review, EPA determined its questionnaire database did not accurately represent direct dischargers in this subcategory. Consequently, EPA used information supplied during the comment period by the American Association of Railroads (AAR) as a basis for its analyses and conclusions on direct dischargers in this subcategory.

AAR is a trade association which currently represents all facilities in the RRLM Subcategory. As discussed in the NODA (see 67 FR 38755), for each RRLM direct discharging facility known to them, AAR provided current permit limits, treatment-in-place, and summarized information on each facility's measured monthly average and daily maximum values. AAR also

provided a year's worth of long-term monitoring data for each facility (see Section 15.1 of the rulemaking record for the AAR surveys).

AAR provided information on 27 facilities. EPA reviewed the information on each of these facilities to ensure they were direct dischargers, discharged wastewaters resulting from operations subject to this final rule, and discharged "process" wastewaters as defined by the final rule. As a result of this review, EPA concluded 18 of the facilities for which AAR provided information do not directly discharge wastewaters exclusively from oily operations. Therefore, EPA's final database consists of nine direct discharging RRLM facilities.

3.1.5 National Estimates

EPA used the data collected in the MP&M and iron and steel industry surveys to: (1) calculate national estimates of the number and types of facilities performing proposed MP&M operations; (2) develop the industry profile presented in Section 4.0; (3) estimate the current pollutant discharges from facilities performing proposed MP&M operations; and (4) identify the baseline of treatment in place. The Agency assigned each survey a specific survey weight to use as a multiplier for national estimates.

Sampling Frame

To produce a mailing list of facilities for the MP&M and the iron and steel surveys, EPA developed a sampling frame of the industry. A sampling frame is a list of all members (sampling units) of a population, from which a random sample of members will be drawn for the survey. Therefore, a sample frame is the basis for the development of a sampling plan to select a random sample. A sample frame size (N) is the total number of members in the frame.

EPA mailed MP&M industry surveys to all of the facilities in the sample. Based on the survey responses, EPA determined that some facilities were "out of scope" or "ineligible" because the regulation would not apply to them. EPA also made a nonrespondent adjustment to the weights (see below).

Calculation of Sample Weights

The next step in developing national estimates is to calculate the base weights, nonresponse adjustments, and the final weights. The base weights and nonresponse adjustments reflect the probability of selection for each facility and adjustments for facility-level nonresponses, respectively. Weighting the data allows inferences to be made about all eligible facilities, not just those included in the sample, but also those not included in the sample or those that did not respond to the survey. Also, the weighted estimates have a smaller variance than unweighted estimates. In its analysis, EPA applied sample weights to survey data.

Calculation of National Estimates

For each characteristic of interest (e.g., number of sites using a particular unit operation or annual discharge flow from a particular unit operation), EPA estimated totals for the entire U.S. industry performing proposed MP&M operations (i.e., national estimates). Each national estimate, Y_{st}, was calculated as:

$$Y_{st} = \sum_{h=1}^{T} [FINALWT_h \cdot \sum_{i=1}^{n_h} y_{hi}] \quad \textbf{(3-1)}$$

where:

h	=	Survey where h = 1,2, ... T;
T	=	Total number of surveys;
$FINALWT_h$	=	Final weight for survey h; and
y_{hi}	=	ith value from the sample.

The development of survey weights and national estimates for the MP&M surveys are discussed in greater detail in the Statistical Summary for the Metal Products & Machinery Industry Surveys (Section 10.0, DCN 16118) and DCNs 36086 and 36087, Section 19.5.

Each national estimate for the entire U.S. iron and steel industry, $\hat{Y}_{st}$, was calculated as:

$$\hat{Y}_{st} = \sum_{h=1}^{12} [FINALWT_h \cdot \sum_{i=1}^{n_h} y_{hi}] \quad \textbf{(3-2)}$$

where:

h	=	Stratum and *h*=1,2,...12 since there are 12 strata;
$FINALWT_h$	=	Final weight for the stratum *h*; and
y_{ih}	=	Ith value from the sample in stratum *h*.

The development of the iron and steel survey weights and national estimates are discussed in greater detail in the Development Document for Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (EPA-821-R-02-004).

3.2 Site Visits

The Agency visited 234 facilities performing proposed MP&M operations and iron and steel sites between 1986 and 2001 to collect information about proposed MP&M operations, water use practices, pollution prevention and treatment technologies, and waste disposal methods, and to evaluate sites for potential inclusion in the MP&M sampling program (described in Section 3.3). In general, the Agency visited sites to encompass the range of sectors, unit operations, and wastewater treatment technologies within the industry (discussed in Section

3.2.1). Table 3-3 lists the number of sites visited within each industrial sector. The total number of site visits presented in this table exceeds 234 because some sites had operations in more than one sector. Figure 3-2 presents the number of facilities visited and sampled by industrial sector. Table 3-3 and Figure 3-2 also include site visits initially conducted as part of the iron and steel rulemaking, the results of which were incorporated into the MP&M rulemaking.

Table 3-3

Number of Sites Visited Within Each Proposed Industrial Sector

Industrial Sectors	Total Number of Sites Visited	Industrial Sectors	Total Number of Sites Visited
Aerospace	13	Office Machines	5
Aircraft	32	Ordnance	15
Bus and Truck	8	Precious Metals and Jewelry	2
Electronic Equipment	23	Printed Wiring Boards	17
Hardware	15	Railroad	10
Household Equipment	4	Ships and Boats	7
Instrument	4	Stationary Industrial Equipment	14
Job Shops	25	Steel Continuous Electroplating[a]	15
Miscellaneous Metal Products	0	Steel Forming and Finishing: Wire Drawing[a]	4
Mobile Industrial Equipment	7		
Motor Vehicle	20		

Source: MP&M and Iron and Steel Site Visits.

[a]The number of sites visited is listed separately for steel forming and finishing and steel continuous electroplating sites instead of by industrial sector.

3.2.1 Criteria for Site Selection

The Agency selected sites for visits based on information contained in the MP&M and iron and steel surveys. The Agency also contacted regional EPA personnel, state environmental agency

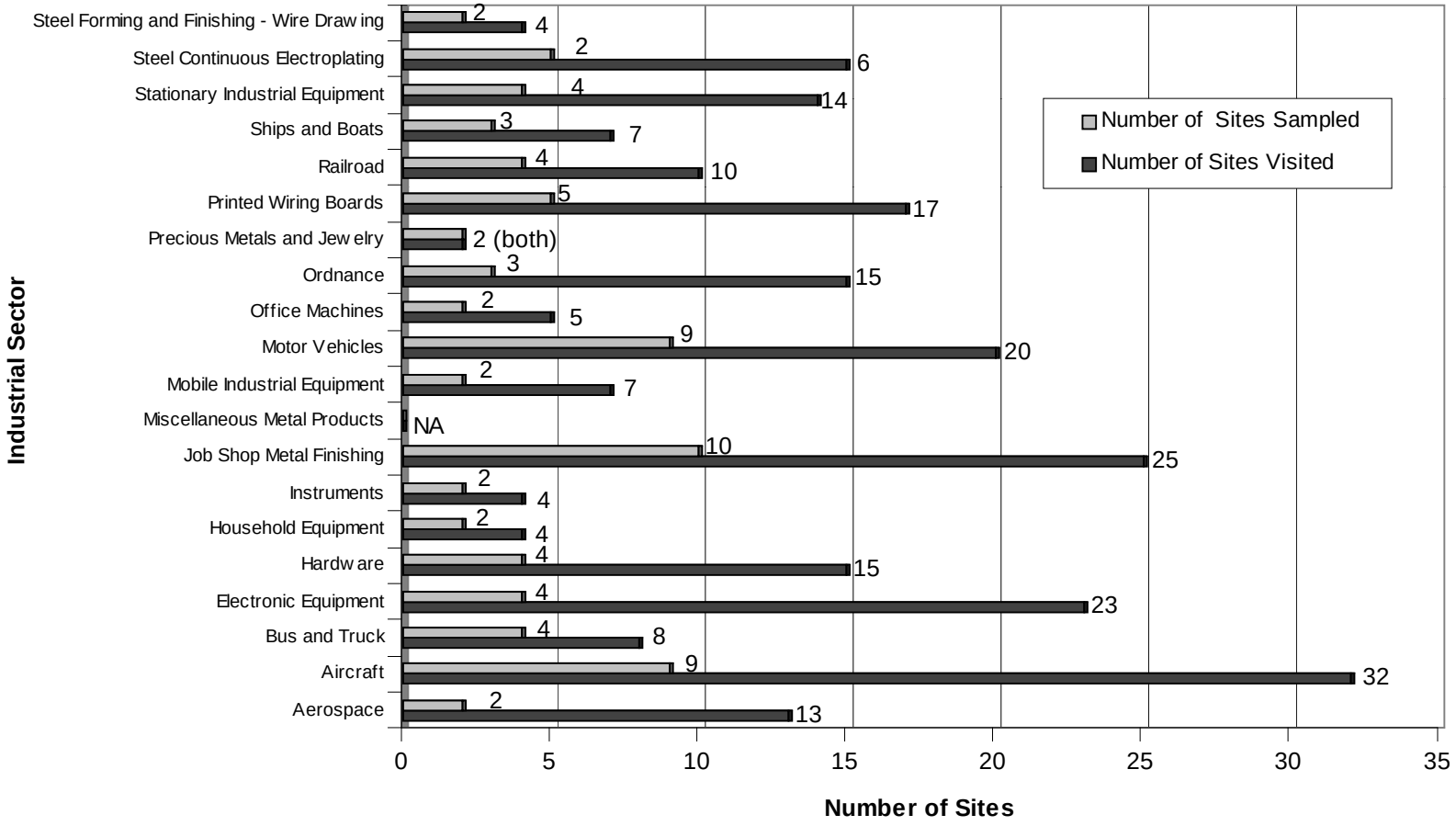


Figure 3-2. Number of Facilities Performing Proposed MP&M Operations Visited and Sampled by Industrial Sector

personnel, and local pretreatment coordinators to identify facilities performing proposed MP&M operations believed to be operating in-process source reduction and recycling technologies and/or well-operated end-of-pipe wastewater treatment technologies. For visits to iron and steel sites prior to receipt of any completed survey, EPA used information collected from the sources used to develop the iron and steel survey receipt list (discussed in Section 3.1.3).

The Agency used the following four general criteria to select sites that encompassed the range of sectors and unit operations within the industry:

1. The site performed proposed MP&M operations in one of the industrial sectors. To assess the variation of unit operations and water-use practices across sectors, the Agency visited sites in 18 industrial sectors.

2. The site performed proposed MP&M operations that needed to be characterized for development of the regulation.

3. The site had water-use practices that were believed to be representative of the best sites within an industrial sector.

4. The site operated in-process source reduction, recycling, or end-of-pipe treatment technologies EPA was evaluating in developing the MP&M technology options.

The Agency also visited sites of various sizes. EPA visited sites with wastewater flows ranging from less than 200 gallons per day (gpd) to more than 1,000,000 gpd.

EPA selected iron and steel sites to visit based on the type of site (steel forming and finishing, integrated, non-integrated), the manufacturing operations at each facility, the type of steel produced (carbon, alloy, stainless), and the wastewater treatment operations. The Agency wanted to visit all types of iron and steel manufacturing operations as well as all types of wastewater treatment operations, including recently installed treatment systems. After EPA evaluated the completed surveys and in response to comments received on the proposed rule, the Agency used information provided by the sites to select additional iron and steel sites to visit.

Site-specific selection criteria are discussed in site visit reports (SVRs) prepared for each site visited by EPA. The SVRs are located in Sections 5.1 and 15.2 of the rulemaking record.

3.2.2 Information Collected

During the site visits, EPA collected the following types of information:

- Types of unit operations performed at the site and the types of metals processed through these operations;
- Purpose of unit operations performed and purpose of any process water and chemical additions used by the unit operations;
- Types and disposition of wastewater generated at the site;
- Types of in-process source reduction and recycling technologies performed at the site;
- Cross-media impacts of in-process source reduction and recycling technologies;
- Types of end-of-pipe treatment technologies performed at the site; and
- Logistical information required for sampling.

This information is documented in the SVRs for each site. Nonconfidential SVRs can be found in the MP&M rulemaking record (see Sections 5.1 and 15.2).

3.3 EPA MP&M Sampling Program

The Agency conducted sampling episodes at 84 sites between 1986 and 2001 to obtain data on the characteristics of wastewater and solid wastes. In addition, EPA performed sampling episodes to assess the following: (1) the loading of pollutants to surface waters and POTWs from facilities performing proposed MP&M operations; (2) the effectiveness of technologies designed to reduce and remove pollutants from wastewater; and (3) the variation of wastewater characteristics across unit operations, metal types processed in each unit operation, and sectors. Table 3-4 indicates the number of sites sampled within each industrial sector. The number of sampled sites presented in the table does not equal 84 because EPA conducted multiple sampling episodes at some sites, and some sites had operations in multiple sectors. Figure 3-2 presents the number of sites visited and sampled by industrial sector. Table 3-4 and Figure 3-2 also include sites initially sampled as part of the iron and steel rulemaking, the results of which were incorporated into the MP&M rulemaking.

Table 3-4

Number of Sites Sampled Within Each Proposed Industrial

Industrial Sectors	Total Number of Sites Sampled	Industrial Sectors	Total Number of Sites Sampled
Aerospace	2	Office Machines	2
Aircraft	9	Ordnance	3
Bus and Truck	4	Precious Metals and Jewelry	2
Electronic Equipment	4	Printed Wiring Boards	5
Hardware	4	Railroad	4
Household Equipment	2	Ships and Boats	3
Instruments	2	Stationary Industrial Equipment	4
Job Shops	10	Steel Continuous Electroplating[a]	5
Miscellaneous Metal Products	0	Steel Forming and Finishing: Wire Drawing[a]	2
Mobile Industrial Equipment	2		
Motor Vehicle	9		

Source: MP&M and Iron and Steel Sampling Episodes.
[a]The number of sites sampled is listed separately for steel forming and finishing and steel continuous electroplater sites instead of by industrial sector.

3.3.1 Criteria for Site Selection

The Agency used information collected during MP&M site visits to identify candidate sites for sampling. The Agency used the following general criteria to select sites for sampling:

- The site performed proposed MP&M operations EPA was evaluating for the MP&M regulation;
- The site processed metals through proposed MP&M operations for which the metal type/unit operation combination needed to be characterized for the sampling database;
- The site performed in-process source reduction, recycling, or end-of-pipe treatment technologies that EPA was evaluating for technology option development; and
- The site performed unit operations in a sector that EPA was evaluating for the MP&M regulation.

The Agency also sampled at sites of various sizes, with wastewater flows ranging from less than 200 gpd to more than 1,000,000 gpd.

EPA selected iron and steel sampling sites using the following criteria:

- The site performed operations either currently regulated under 40 CFR 420 or identified in the Preliminary Study or otherwise identified as iron and steel operations;

- The site performed high-rate recycling, in-process treatment, or end-of-pipe treatment operations that EPA believed may represent potential model pollutant control technology; and

- The site's compliance monitoring data indicated that it was among the better performing pollutant control systems in the industry, based on comparisons of monitoring data from other facilities with limits from the 1982 regulation in their permits.

In response to comments received on the proposed rule, EPA conducted wastewater sampling at four additional sites between November 2000 and April 2001. EPA selected these additional sites for the following reasons:

- As a collaborative effort between the American Iron and Steel Institute and EPA, to supplement the 1997/1998 sampling results by further characterizing raw sinter plant wastewater, specifically the amount of dioxins and furans generated by this industry, and to evaluate wastewater treatment system performance; and

- To further characterize untreated wastewater generated by continuous casting and hot forming operations at non-integrated steel mills.

After it selected a site for sampling, the Agency prepared a detailed sampling and analysis plan (SAP), based on the information contained in the SVR and follow-up correspondence with the site. EPA prepared the SAPs to ensure samples collected would be representative of the sampled waste streams. The SAPs contained the following types of information: site-specific selection criteria for sampling; information about site operations; sampling point locations and sample collection, preservation, and transportation procedures; site contacts; and sampling schedules.

3.3.2 Information Collected

In addition to wastewater and solid waste samples, the Agency collected the following types of information during each sampling episode:

- Dates and times of sample collection;

- Flow data corresponding to each sample;

- Production data corresponding to each sample of wastewater from proposed MP&M operations;
- Design and operating parameters for source reduction, recycling, and treatment technologies characterized during sampling;
- Information about site operations that had changed since the site visit or that were not included in the SVR; and
- Temperature and pH of the sampled waste streams.

EPA documented all data collected during sampling episodes in the sampling episode report (SER) for each sampled site. SERs are located in Sections 5.2 and 15.3 of the rulemaking record.

3.3.3 Sample Collection and Analysis

The Agency collected, preserved, and transported all samples according to EPA protocols as specified in EPA's Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants (1) (Section 4.2, DCN 17334) and the MP&M Quality Assurance Project Plan (QAPP) (Section 4.4, DCN 17366). These documents are located in the rulemaking record. Appendix B presents the analytical methods and baseline values.

In general, EPA collected composite samples from wastewater streams with compositions that the Agency expected to vary over the course of a production period (e.g., overflowing rinse waters, wastewater from continuous recycling and treatment systems). The Agency collected grab samples from unit operation baths or rinses that the facility did not continuously discharge and that the Agency did not expect to vary over the course of a production period. EPA also collected composite samples of wastewater treatment sludge at 11 facilities. EPA collected the required types of quality control samples as described in the MP&M QAPP, such as blanks and duplicate samples, to verify the precision and accuracy of sample analyses.

The Agency shipped samples via overnight air transportation to EPA-approved laboratories, where the samples were analyzed for metal and organic pollutants and additional parameters (including several water quality parameters). EPA analyzed metal pollutants using EPA Method 1620 (2), volatile organic pollutants using EPA Method 1624 (3), and semivolatile organic pollutants using EPA Method 1625 (4). Tables 3-5 and 3-6 list the metal and organic pollutants, respectively, analyzed using these methods. Table 3-5 also lists additional metal pollutants that EPA analyzed in the MP&M sampling program, but, as specified by EPA Method 1620, were not subject to the rigorous quality assurance/quality control procedures established by the QAPP.

Table 3-5

Metal Constituents Measured Under the MP&M Sampling Program (EPA Method 1620)

Metal Constituents		
ALUMINUM	COBALT	SELENIUM
ANTIMONY	COPPER	SILVER
ARSENIC	IRON	SODIUM
BARIUM	LEAD	THALLIUM
BERYLLIUM	MAGNESIUM	TIN
BORON	MANGANESE	TITANIUM
CADMIUM	MERCURY	VANADIUM
CALCIUM	MOLYBDENUM	YTTRIUM
CHROMIUM	NICKEL	ZINC
Additional Metal Constituents[a] Not Subject to Rigorous QA/QC Procedures Per Method 1620		
BISMUTH	LANTHANUM	SAMARIUM
CERIUM	LITHIUM	SCANDIUM
DYSPROSIUM	LUTETIUM	SILICON
ERBIUM	NEODYMIUM	STRONTIUM
EUROPIUM	NIOBIUM	SULFUR
GADOLINIUM	OSMIUM	TANTALUM
GALLIUM	PALLADIUM	TELLURIUM
GERMANIUM	PHOSPHORUS	TERBIUM
GOLD	PLATINUM	THORIUM
HAFNIUM	POTASSIUM	THULIUM
HOLMIUM	PRASEODYMIUM	TUNGSTEN
INDIUM	RHENIUM	URANIUM
IODINE	RHODIUM	YTTERBIUM
IRIDIUM	RUTHENIUM	ZIRCONIUM

Source: EPA Method 1620.

[a]Analyses for these metals were used primarily for screening purposes

Table 3-6

Organic Constituents Measured Under the MP&M Sampling Program (EPA Methods 1624 and 1625)

Volatile Organic Constituents (EPA Method 1624)	
ACRYLONITRILE	TRANS-1,4-DICHLORO-2-BUTENE
BENZENE	TRIBROMOMETHANE
BROMODICHLOROMETHANE	TRICHLOROETHENE
BROMOMETHANE	TRICHLOROFLUOROMETHANE
CARBON DISULFIDE	VINYL ACETATE
CHLOROACETONITRILE	VINYL CHLORIDE
CHLOROBENZENE	1,1-DICHLOROETHANE
CHLOROETHANE	1,1-DICHLOROETHENE
CHLOROFORM	1,1,1-TRICHLOROETHANE
CHLOROMETHANE	1,1,1,2-TETRACHLOROETHANE
CIS-1,3-DICHLOROPROPENE	1,1,2-TRICHLOROETHANE
CROTONALDEHYDE	1,1,2,2-TETRACHLOROETHANE
DIBROMOCHLOROMETHANE	1,2-DIBROMOETHANE
DIBROMOMETHANE	1,2-DICHLOROETHANE
DIETHYL ETHER	1,2-DICHLOROPROPANE
ETHYL CYANIDE	1,2,3-TRICHLOROPROPANE
ETHYL METHACRYLATE	1,3-BUTADIENE, 2-CHLORO
ETHYLBENZENE	1,3-DICHLOROPROPANE
IODOMETHANE	1,4-DIOXANE
ISOBUTYL ALCOHOL	2-BUTANONE
M-XYLENE	2-CHLOROETHYL VINYL ETHER
METHYL METHACRYLATE	2-HEXANONE
METHYLENE CHLORIDE	2-PROPANONE
O+P-XYLENE	2-PROPEN-1-OL
TETRACHLOROETHENE	2-PROPENAL
TETRACHLOROMETHANE	2-PROPENENITRILE, 2-METHYL-
TOLUENE	3-CHLOROPROPENE
TRANS-1,2-DICHLOROETHENE	4-METHYL-2-PENTANONE
TRANS-1,3-DICHLOROPROPENE	ACROLEIN

Table 3-6 (Continued)

Semivolatile Organic Constituents (EPA Method 1625)	
ACENAPHTHENE	BENZO(A)ANTHRACENE
ACENAPHTHYLENE	BENZO(A)PYRENE
ACETOPHENONE	BENZO(B)FLUORANTHENE
ALPHA-TERPINEOL	BENZO(GHI)PERYLENE
ANILINE	BENZO(K)FLUORANTHENE
ANILINE, 2,4,5-TRIMETHYL-	BENZOIC ACID
ANTHRACENE	BENZONITRILE, 3,5-DIBROMO-4-HYDROXY-
ARAMITE	BENZYL ALCOHOL
BENZANTHRONE	BETA-NAPHTHYLAMINE
BENZENETHIOL	BIPHENYL
BENZIDINE	BIPHENYL, 4-NITRO
BIS(2-CHLOROETHOXY)METHANE	N-EICOSANE
BIS(2-CHLOROETHYL) ETHER	N-HEXACOSANE
BIS(2-CHLOROISOPROPYL) ETHER	N-HEXADECANE
BIS(2-ETHYLHEXYL) PHTHALATE	N-NITROSODI-N-BUTYLAMINE
BUTYL BENZYL PHTHALATE	N-NITROSODIETHYLAMINE
CARBAZOLE	N-NITROSODIMETHYLAMINE
CHRYSENE	N-NITROSODIPHENYLAMINE
CIODRIN	N-NITROSOMETHYLETHYLAMINE
CROTOXYPHOS	N-NITROSOMETHYLPHENYLAMINE
DI-N-BUTYL PHTHALATE	N-NITROSOMORPHOLINE
DI-N-OCTYL PHTHALATE	N-NITROSOPIPERIDINE
DI-N-PROPYLNITROSAMINE	N-OCTACOSANE
DIBENZO(A,H)ANTHRACENE	N-OCTADECANE
DIBENZOFURAN	N-TETRACOSANE
DIBENZOTHIOPHENE	N-TETRADECANE
DIETHYL PHTHALATE	N-TRIACONTANE
DIMETHYL PHTHALATE	N,N-DIMETHYLFORMAMIDE
DIMETHYL SULFONE	NAPHTHALENE
DIPHENYL ETHER	NITROBENZENE
DIPHENYLAMINE	O-ANISIDINE
DIPHENYLDISULFIDE	O-CRESOL
ETHANE, PENTACHLORO-	O-TOLUIDINE
ETHYL METHANESULFONATE	O-TOLUIDINE, 5-CHLORO-
ETHYLENETHIOUREA	P-CHLOROANILINE
FLUORANTHENE	P-CRESOL
FLUORENE	P-CYMENE
HEXACHLOROBENZENE	P-DIMETHYLAMINOAZOBENZENE
HEXACHLOROBUTADIENE	P-NITROANILINE
HEXACHLOROCYCLOPENTADIENE	PENTACHLOROBENZENE
HEXACHLOROETHANE	PENTACHLOROPHENOL
HEXACHLOROPROPENE	PENTAMETHYLBENZENE
HEXANOIC ACID	PERYLENE
INDENO(1,2,3-CD)PYRENE	PHENACETIN

Table 3-6 (Continued)

Semivolatile Organic Constituents (EPA Method 1625)	
ISOPHORONE	PHENANTHRENE
ISOSAFROLE	PHENOL
LONGIFOLENE	PHENOL, 2-METHYL-4,6-DINITRO-
MALACHITE GREEN	PHENOTHIAZINE
MESTRANOL	PRONAMIDE
METHAPYRILENE	PYRENE
METHYL METHANESULFONATE	PYRIDINE
N-DECANE	RESORCINOL
N-DOCOSANE	SAFROLE
N-DODECANE	SQUALENE
STYRENE	2-NITROANILINE
THIANAPHTHENE	2-NITROPHENOL
THIOACETAMIDE	2-PHENYLNAPHTHALENE
THIOXANTHE-9-ONE	2-PICOLINE
TOLUENE, 2,4-DIAMINO-	2,3-BENZOFLUORENE
TRIPHENYLENE	2,3-DICHLOROANILINE
TRIPROPYLENEGLYCOL METHYL ETHER	2,3-DICHLORONITROBENZENE
1-BROMO-2-CHLOROBENZENE	2,3,4,6-TETRACHLOROPHENOL
1-BROMO-3-CHLOROBENZENE	2,3,6-TRICHLOROPHENOL
1-CHLORO-3-NITROBENZENE	2,4 -DICHLOROPHENOL
1-METHYLFLUORENE	2,4-DIMETHYLPHENOL
1-METHYLPHENANTHRENE	2,4-DINITROPHENOL
1-NAPHTHYLAMINE	2,4-DINITROTOLUENE
1-PHENYLNAPHTHALENE	2,4,5-TRICHLOROPHENOL
1,2-DIBROMO-3-CHLOROPROPANE	2,4,6-TRICHLOROPHENOL
1,2-DICHLOROBENZENE	2,6-DI-TERT-BUTYL-P-BENZOQUINONE
1,2-DIPHENYLHYDRAZINE	2,6-DICHLORO-4-NITROANILINE
1,2,3-TRICHLOROBENZENE	2,6-DICHLOROPHENOL
1,2,3-TRIMETHOXYBENZENE	2,6-DINITROTOLUENE
1,2,4-TRICHLOROBENZENE	3-METHYLCHOLANTHRENE
1,2,4,5-TETRACHLOROBENZENE	3-NITROANILINE
1,2:3,4-DIEPOXYBUTANE	3,3'-DICHLOROBENZIDINE
1,3-DICHLORO-2-PROPANOL	3,3'-DIMETHOXYBENZIDINE
1,3-DICHLOROBENZENE	3,6-DIMETHYLPHENANTHRENE
1,3,5-TRITHIANE	4-AMINOBIPHENYL
1,4-DICHLOROBENZENE	4-BROMOPHENYL PHENYL ETHER
1,4-DINITROBENZENE	4-CHLORO-2-NITROANILINE
1,4-NAPHTHOQUINONE	4-CHLORO-3-METHYLPHENOL
1,5-NAPHTHALENEDIAMINE	4-CHLOROPHENYL PHENYL ETHER
2-(METHYLTHIO)BENZOTHIAZOLE	4-NITROPHENOL
2-CHLORONAPHTHALENE	4,4'-METHYLENEBIS(2-CHLOROANILINE)
2-CHLOROPHENOL	4,5-METHYLENE PHENANTHRENE
2-ISOPROPYLNAPHTHALENE	5-NITRO-O-TOLUIDINE
2-METHYLBENZOTHIOAZOLE	7,12-DIMETHYLBENZ(A)ANTHRACENE
2-METHYLNAPHTHALENE	N-NITRODOSI-N-PROPYLAMINE

Source: EPA Methods 1624 and 1625.

The Agency used these metals analyses for screening purposes and did not select the metals for regulation in this rulemaking (see Section 7.0). EPA analyzed additional parameters, including several water quality parameters, using analytical methods contained in EPA's Methods for Chemical Analysis of Water and Wastes (5). Table 3-7 lists these parameters, along with the method and technique used to analyze for each parameter. Method descriptions are included in the MP&M QAPP. The specific parameters measured in each sample are listed in the SER for each sampling episode.

Quality control measures used in performing all analyses complied with the guidelines specified in the analytical methods and in the MP&M QAPP. EPA reviewed all analytical data to ensure that these measures were followed and that the resulting data were within the QAPP-specified acceptance criteria for accuracy and precision.

As discussed previously, upon receipt and review of the analytical data for each site, EPA prepared an SER to document the data collected during sampling, the analytical results, and the technical analyses of the results. The SAPs and correspondence with site personnel are included as appendices to the SERs.

3.4 Other Sampling Data

The Association of American Railroads (AAR), the Hampton Roads Sanitation District (HRSD), the Los Angeles County Sanitation Districts (LACSD), and the Association Connecting Electronic Industries (IPC) proposed potential sampling sites to the Agency, and EPA visited these sites to identify candidates for sampling. After conducting site visits, EPA selected six sites for sampling episodes.

EPA selected the six sites to characterize end-of-pipe treatment technologies in metal finishing and aircraft parts job shops and the railroad and shipbuilding industrial sectors. AAR sampled a railroad line maintenance that used dissolved air flotation (DAF) to treat MP&M process wastewater. HRSD sampled a ship manufacturer that uses DAF, chemical precipitation, and cyanide destruction to treat process wastewater. LACSD sampled two metal finishing job shops and one aircraft parts manufacturing job shop. EPA selected the LACSD sites to provide data for cyanide treatment and also conducted effluent variability sampling at one of the metal finishing job shops. The IPC site is a printed wiring board facility that uses chemical precipitation with chelation breaking, cyanide destruction and batch treatment to treat process wastewater.

EPA prepared detailed SAPs based on the information collected during the six site visits, and AAR, HRSD and LACSD collected the wastewater samples. EPA also prepared the sampling episode reports. In addition to the wastewater samples, sampling personnel documented the collection date and time, sample flow data, treatment unit design and operating parameters, and temperature and pH of the sampled waste streams. All data collected during sampling episodes are documented in the SER for each sampled site, which are located in the

Table 3-7

Additional Parameters Measured Under the MP&M Sampling Program

Parameter	EPA Method
Acidity	305.1
Alkalinity	310.1
Ammonia as Nitrogen	350.1
BOD 5-Day (Carbonaceous)	405.1
Chemical Oxygen Demand (COD)	410.1 410.2
Chloride	325.3
Chromium, Hexavalent	218.4
Cyanide, Amenable	335.1
Cyanide, Total	335.2
Cyanide, Weak Acid Dissociable (WAD)	1677
Fluoride	340.2
Nitrogen, Total Kjeldahl	351.2
Oil and Grease	413.2
Oil and Grease (as HEM)	1664
pH	150.1
Phenolics, Total Recoverable	420.2
Phosphorus, Total	365.4
Sulfate	375.4
Sulfide, Total	376.1, 376.2
Total Dissolved Solids (TDS)	160.1
Total Organic Carbon (TOC)	415.1
Total Petroleum Hydrocarbons (as SGT-HEM)	1664
Total Suspended Solids (TSS)	160.2
Ziram (zinc dimethyldithiocarbamate)	630.1

Source: EPA Methods for Chemical Analysis of Water and Wastes (5).

MP&M rulemaking record (see Sections 5.2 and 15.3). EPA combined these data with data collected from the MP&M sampling program. For a discussion of sample collection and the sampling protocols for the IPC site, see the SER (DCN 16684) in Section 15.3.7 of the MP&M rulemaking record.

AAR, HRSD, and LACSD collected, preserved, and transported all samples according to EPA protocols as specified in EPA's Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants (Section 4.2, DCN 17334) and the MP&M QAPP. Procedures for shipping and analysis of the samples were similar to those discussed in Section 3.3 with the exception that some samples were shipped directly to internal sanitation district laboratories for analysis. Pollutant parameters and analytical methods were agreed upon by EPA, AAR, HRSD, and LACSD and were treated as equivalent to those in the EPA MP&M sampling program.

3.5 Other Industry-Supplied Data

EPA evaluated other industry data in developing the MP&M effluent guidelines. The data sources reviewed included:

- Public comments to the May 1995 Proposal, January 2001 proposal, and June 2002 NODA;
- The Metal Finishing F006 Benchmark Study (6);
- Data supporting the Final Rule for the F006 Accumulation Time Extension (65 FR 12377, March 8, 2000);
- Data provided by the Aluminum Anodizing Council (AAC), the American Wire Producers Association (AWPA), and the Aerospace Association; and
- Surveys provided by the North Carolina Pretreatment Consortium.

EPA also reviewed data from stormwater pollution prevention plans provided by several shipbuilding sites, dry dock data from a shipbuilding site, and data from periodic compliance monitoring reports/discharge monitoring reports for 19 sites that were part of the Agency's wastewater sampling program.

The Agency included data submitted with comments on the 1995 MP&M Proposed Rule, the 2001 MP&M Proposed Rule, or the 2002 MP&M NODA in the establishment of effluent limitations and standards if they met the following criteria:

- Measurements of daily effluent concentration were provided;

- Data represented effluent from a treatment system equivalent to EPA's BAT options;
- Samples represented fully treated effluent (as defined by Options 2, 6, or 10 as appropriate); and
- Treated pollutants were identified and/or unit operations contributing pollutants were described.

In addition, the North Carolina Pretreatment Consortium conducted a survey of POTWs in that state. EPA evaluated the results of these surveys and used the results as appropriate to verify and supplement information from the previous MP&M POTW survey on loadings, number of facilities performing proposed MP&M operations served, and administrative costs. The results of EPA's analysis of this data is in the Comment Response Document, Issue Codes 4 and 20G. The AMSA and North Carolina Pretreatment Consortium surveys can be found in Section 17.6 of the rulemaking record.

3.6 Other Data Sources

In developing the MP&M effluent guidelines, EPA evaluated the following existing data sources:

1. EPA Engineering and Analysis Division (EAD) databases from development of effluent guidelines for miscellaneous metals industries;
2. The Fate of Priority Pollutants in Publicly Owned Treatment Works (50 POTW Study) database;
3. The Office of Research and Development (ORD) National Risk Management and Research Laboratory (NRMRL) treatability database;
4. The Domestic Sewage Study;
5. The Toxics Release Inventory (TRI) database; and
6. Discharge Monitoring Reports (DMR) from EPA's Permit Compliance System (PCS).

These data sources and their uses for the development of the MP&M effluent guidelines are discussed below.

3.6.1 EPA/EAD Databases

As discussed in Section 2.0, EPA had earlier promulgated effluent guidelines for 13 metals industries. In developing these past effluent guidelines, EPA collected wastewater samples to characterize the unit operations and treatment systems at sites in these industries. Facilities performing proposed MP&M operations operate many of the same or similar sampled unit operations and treatment systems; therefore, EPA evaluated these data for transfer to the MP&M effluent guidelines development effort.

For the pollutant loading and wastewater characterization efforts, EPA reviewed the data collected for unit operations performed at both facilities performing proposed MP&M operations and at sites in the other metals industries. EPA reviewed the Technical Development Documents (TDDs), sampling episode reports, and supporting rulemaking record materials for the other metals industries to identify available data. EPA used these data for the preliminary assessment of the industry, but did not use these data to estimate pollutant loadings because EPA obtained sufficient data from the MP&M sampling program to characterize the proposed MP&M operations.

For the MP&M technology effectiveness assessment effort, EPA reviewed sampling data collected to characterize treatment systems for the development of effluent guidelines for miscellaneous metals industries. For several previous effluent guidelines, EPA used treatment data from metals industries to develop the Combined Metals Database (CMDB), which served as the basis for developing limits for these industries. EPA also developed a separate database used as the basis for limits for the Metal Finishing category. EPA used the CMDB and Metal Finishing data as a guide in identifying well-designed and well-operated treatment systems. EPA did not use these data in developing the MP&M technology effectiveness concentrations, since the Agency collected sufficient data from facilities performing proposed MP&M operations to develop technology effectiveness concentrations.

3.6.2 Fate of Priority Pollutants in Publicly Owned Treatment Works Database

In September 1982, EPA published the Fate of Priority Pollutants in Publicly Owned Treatment Works (7), referred to as the 50-POTW Study. The purpose of this study was to generate, compile, and report data on the occurrence and fate of the 129 priority pollutants in 50 POTWs. The report presents all of the data collected, the results of preliminary evaluations of these data, and the results of calculations to determine the following:

- The quantity of priority pollutants in the influent to POTWs;
- The quantity of priority pollutants discharged from the POTWs;
- The quantity of priority pollutants in the effluent from intermediate process streams; and

- The quantity of priority pollutants in the POTW sludge streams.

EPA used the data from this study to assess removal by POTWs of pollutants of concern (see Section 7). To provide consistency for data analysis and establishment of removal efficiencies, EPA reviewed the 50-POTW Study and standardized the reported minimum levels of quantitation (MLs) for use in the MP&M final rule. EPA's review of the 50-POTW Study is described in more detail in the development document for the MP&M proposed regulation located in Section 7.2 of the rulemaking record, DCN 16377, and in memoranda located in Section 6.4 of the rulemaking record.

3.6.3 National Risk Management Research Laboratory (NRMRL) Treatability Database

EPA's ORD developed the NRMRL (formerly RREL) treatability database to provide data on the removal and destruction of chemicals in various types of media, including water, soil, debris, sludge, and sediment. This database contains treatability data from POTWs as well as industrial facilities for various pollutants. The database includes physical and chemical data for each pollutant, the types of treatment used for specific pollutants, the types of wastewater treated, the size of the POTW or industrial plant, and the treatment concentrations achieved. EPA used the NRMRL database to estimate pollutant reductions achieved by POTWs for MP&M pollutants of concern that were not found in the 50-POTW database. The Agency used these percent removal estimates in calculating the pollutant loads removed by indirect discharging facilities performing proposed MP&M operations. Because the 50-POTW database contained sufficient data, EPA did not use these percent removal estimates in the pass-through analysis. EPA used only treatment technologies representative of typical POTW secondary treatment operations (i.e., activated sludge, activated sludge with filtration, aerated lagoons). The Agency further edited these files to include information pertaining only to domestic or industrial wastewater. EPA used pilot-scale and full-scale data, and eliminated bench-scale data and data from less reliable references.

3.6.4 The Domestic Sewage Study

In February 1986, EPA issued the Report to Congress on the Discharge of Hazardous Wastes to Publicly Owned Treatment Works (8), referred to as the Domestic Sewage Study (DSS). This report, which was based in part on the 50-POTW Study, revealed a significant number of sites discharging pollutants to POTWs. These pollutants are a threat to the treatment capability of the POTW. These pollutants were not regulated by national effluent regulations. Some of the major sites identified were in the metals industries, particularly one called equipment manufacturing and assembly. This industry included sites that manufacture such products as office machines, household appliances, scientific equipment, and industrial machine tools and equipment. The DSS estimated that this category discharges 7,715 metric tons per year of priority hazardous organic pollutants, which are presently unregulated. Data on priority hazardous metals discharges were unavailable for this category. Further review of the DSS revealed miscellaneous categories that were related to metals industries, namely the motor

vehicle category, which includes servicing of new and used cars and engine and parts rebuilding, and the transportation services category, which includes railroad operations, truck service and repair, and aircraft servicing and repair. EPA used the information in the DSS in developing the 1989 Preliminary Data Summary (PDS) for the MP&M rulemaking.

3.6.5 Toxics Release Inventory (TRI) Database

The TRI database contains specific toxic chemical release and transfer information from manufacturing facilities throughout the United States. This database was established under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), which Congress passed to promote planning for chemical emergencies and to provide information to the public about the presence and release of toxic and hazardous chemicals. Each year, manufacturing facilities meeting certain activity thresholds must report the estimated releases and transfers of listed toxic chemicals to EPA and to the state or tribal entity in whose jurisdiction the facility is located. The TRI list includes more than 600 chemicals and 30 chemical categories.

EPA considered using the TRI database in developing the MP&M effluent guidelines. However, EPA did not use TRI data on wastewater discharges from facilities performing proposed MP&M operations because sufficient data were not available for effluent guidelines development. Also, many of the reported discharges are estimates, not based on measurement. For example, in developing the MP&M effluent guidelines, EPA uses wastewater influent concentrations to characterize a facility's wastewater and to calculate treatment efficiency (i.e., percent removal across the treatment system). The TRI database does not provide concentrations for the influent to a facility's treatment system. EPA also did not use the data on wastewater discharge because many facilities performing proposed MP&M operations do not meet the reporting thresholds for the TRI database.

3.6.6 Discharge Monitoring Reports from EPA's Permit Compliance System

The PCS provides information on companies which have been issued permits to discharge wastewater into surface water. Users can review information on when a permit was issued and expires, how much the company is permitted to discharge, and the actual monitoring data showing what the company has discharged. Respondents to MP&M surveys and commentors on the May 1995 proposal, January 2001 proposal, and June 2002 NODA supplied facility specific DMR data. In addition, EPA retrieved facility limits and process wastewater monitoring data from facilities performing proposed MP&M operations for selected pollutant parameters (e.g., metals, oil and grease). EPA used DMR data to estimate industry baseline pollutant loadings. Section 12.3 discusses the estimation of baseline pollutant loadings using PCS data.

3.7 References

1. U.S. Environmental Protection Agency. Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants, April 1977.

2. U.S. Environmental Protection Agency. Method 1620 Draft - Metals by Inductively Coupled Plasma Atomic Emission Spectroscopy and Atomic Absorption Spectroscopy, September 1989.

3. U.S. Environmental Protection Agency. Method 1624 Revision C - Volatile Organic Compounds by Isotope Dilution GCMS, June 1989.

4. U.S. Environmental Protection Agency. Method 1625 Revision C - Semivolatile Organic Compounds by Isotope Dilution GCMS, June 1989.

5. U.S. Environmental Protection Agency. Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, Washington, DC, March 1979.

6. U.S. Environmental Protection Agency. Metal Finishing F006 Benchmark Study. Washington, DC, September 1998.

7. U.S. Environmental Protection Agency. Fate of Priority Pollutants in Publicly Owned Treatment Works. EPA 440/1-82/303, Washington, DC, September 1982.

8. U.S. Environmental Protection Agency. Report to Congress on the Discharge of Hazardous Wastes to Publicly Owned Treatment Works. EPA 530-SW-86-004, Washington, DC, February 1986.

9. U.S. Environmental Protection Agency. Development Document for Final Effluent Limitations Guidelines and Standards for the Iron and Steel Manufacturing Point Source Category (EPA-821-R-02-004).

4.0 INDUSTRY DESCRIPTION

As discussed in Section 1.0, EPA has promulgated effluent limitations for the MP&M Point Source Category that regulate directly discharged process wastewaters from oily operations at facilities engaged in manufacturing, rebuilding, or maintenance of metal parts, products, or machines for use in one or more of the following 16 industrial sectors:

- Aerospace;
- Aircraft;
- Bus and Truck;
- Electronic Equipment;
- Hardware;
- Household Equipment;
- Instruments;
- Mobile Industrial Equipment;
- Motor Vehicle;
- Office Machine;
- Ordnance;
- Precious Metals and Jewelry;
- Railroad;
- Ships and Boats;
- Stationary Industrial Equipment; and
- Miscellaneous Metal Products.

This section describes these facilities. For the final rule, EPA evaluated facilities in the 16 MP&M industrial sectors above and Job Shop, Printed Wiring Board, and Steel Forming and Finishing industrial sectors (i.e., Iron & Steel Wire Drawers and Steel Electroplaters). For the purposes of this section, EPA is identifying all facilities evaluated for the final rule as "MP&M facilities." Section 4.1 presents an overview of MP&M facilities; Section 4.2 provides a general discussion of unit operations performed, types of metal processed, and volumes of wastewater discharged at MP&M facilities; Section 4.3 discusses trends at MP&M facilities; and Section 4.4 lists the references used in this section.

4.1 Overview of MP&M facilities

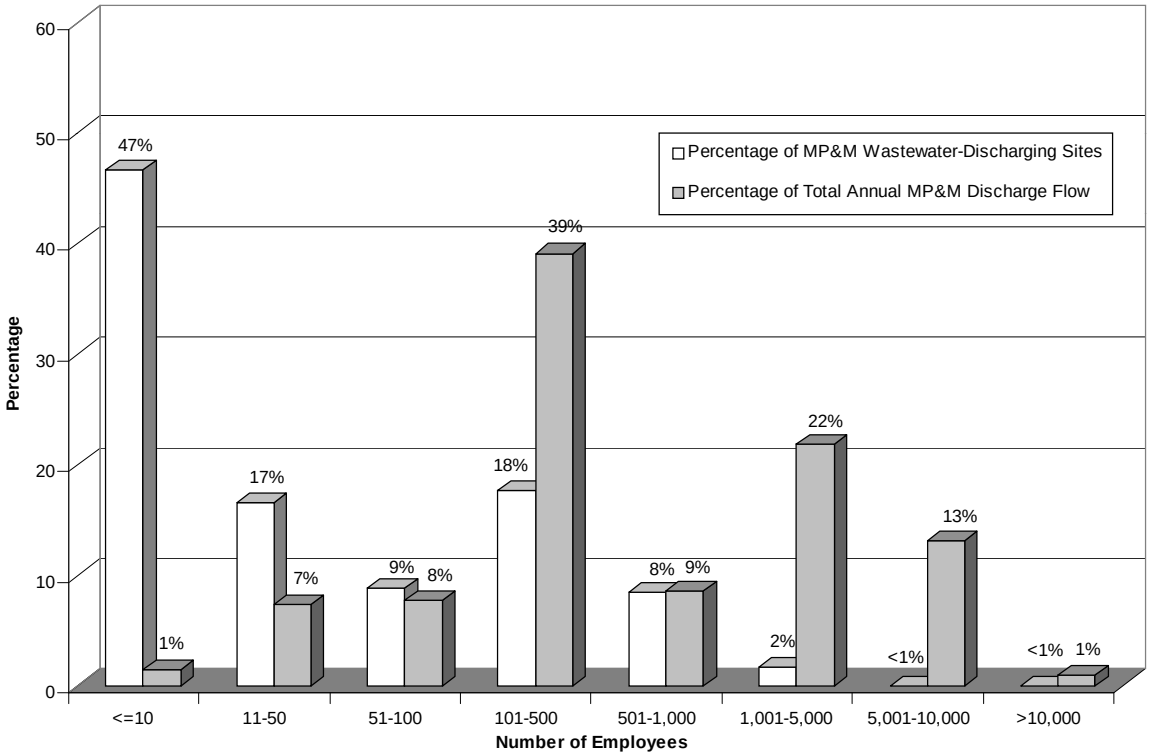
This subsection discusses the number and size of MP&M facilities evaluated for regulation, the geographic distribution of these facilities, the number of wastewater-discharging MP&M facilities, and the number of MP&M facilities that do not discharge wastewater.

4.1.1 Number and Size of MP&M Facilities

Based on information in the MP&M survey database, there are an estimated 57,000 MP&M facilities in the United States.[1] Results of the detailed surveys indicate there are an estimated 44,000 MP&M facilities that discharge process wastewater (i.e., wastewater-discharging MP&M facilities). The remaining 13,000 facilities fall into one of three categories: zero dischargers, non-water-users, or contract haulers. A zero discharger is a facility that does not discharge process wastewater to a treatment system, a non-water-user is a facility that does not use process water in their unit operations, and a contract hauler is a facility that has all of their process wastewater contract hauled. For the purposes of the evaluating options for the final rule, EPA considers MP&M facilities that discharge wastewater exclusively to privately owned treatment works to be zero dischargers that contract haul their wastewater to centralized wastewater treatment facilities.

Wastewater-discharging MP&M facilities range in size from facilities with less than 10 employees to facilities with thousands of employees. As shown in Figure 4-1, 91 percent of the wastewater-discharging MP&M facilities have 500 or fewer employees. These facilities discharge 55 percent (i.e., 43 billion gallons per year) of the total annual wastewater discharge for the MP&M industry. The 9 percent of the wastewater-discharging MP&M facilities that have more than 500 employees discharge 35 billion gallons of wastewater annually, or 45 percent of the total annual wastewater discharge for the MP&M category.

[1]More information on how the MP&M survey database was used to generate national estimates is in the MP&M rulemaking record (see Section 10.0, DCN 16118 and Section 19.5, DCNs 36086 and 36087).



Source: MP&M Survey Database.
Note: There are 44,000 wastewater-discharging MP&M facilities. Total MP&M wastewater flow is 78.2 billion gallons per year.

Figure 4-1. Percentage of Wastewater-Discharging MP&M facilities and Percentage of Annual Wastewater Discharge by Number of Employees

4.1.2 Geographic Distribution

Wastewater-discharging MP&M facilities are located throughout the United States. They are mostly concentrated in industrialized areas, with the highest concentration of facilities in California, Pennsylvania, and Illinois. The following map shows the estimated number of wastewater-discharging MP&M facilities located in each EPA region.

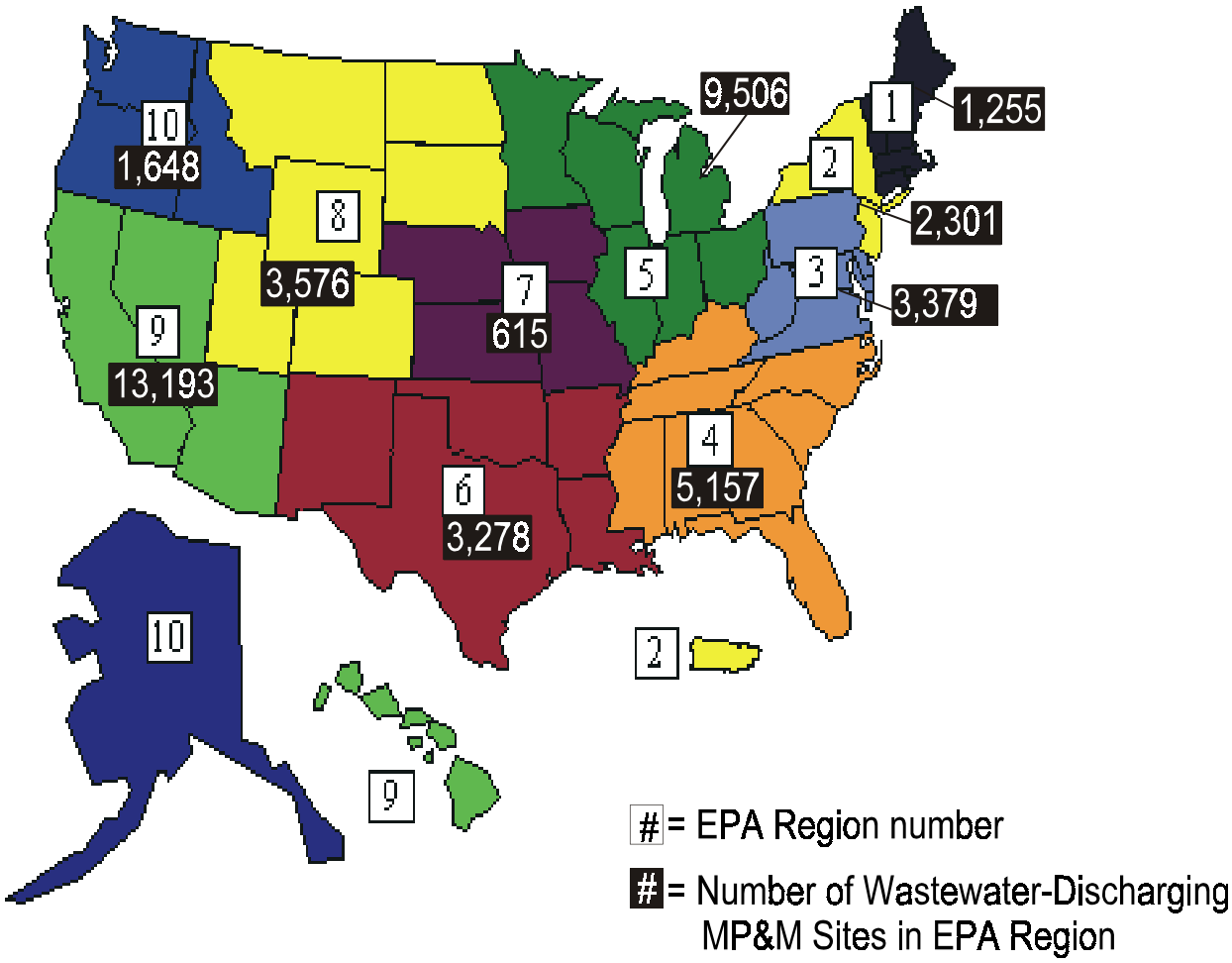


Figure 4-2. Estimated Number of Wastewater-Discharging MP&M facilities by EPA Region

4.1.3 Wastewater-Discharging Facilities

EPA evaluated MP&M facilities in 20 industrial sectors for the final rule. Table 4-1 summarizes the number of wastewater-discharging MP&M facilities by industrial sector. Because some MP&M facilities perform operations or make products used in more than one sector, the sum of wastewater-discharging MP&M facilities by sector exceeds the total number of wastewater-discharging MP&M facilities identified in the surveys. As shown in Table 4-1, the ordnance sector has the smallest number of wastewater-discharging facilities (405) and the job shop sector has the largest number of wastewater-discharging facilities (14,589).

Table 4-1

Wastewater-Discharging MP&M facilities by Sector

Sector	Estimated Number of MP&M Facilities That Discharge Process Wastewater[a]
Aerospace	712
Aircraft	1,598
Bus and Truck	3,522
Electronic Equipment	2,644
Hardware	6,223
Household Equipment	3,137
Instruments	3,902
Iron and Steel Wire Drawers[b, c]	153
Job Shop [c]	14,589
Miscellaneous Metal Products	5,316
Mobile Industrial Equipment	1,079
Motor Vehicle	13,070
Office Machine	1,092
Ordnance	405
Precious Metals and Jewelry	1,860
Printed Circuit Boards [c]	1,456
Railroad	5,181
Ships and Boats	1,367
Stationary Industrial Equipment	1,724
Steel Electroplaters[b, c]	28

Source: MP&M Survey Database.

[a] Because some facilities perform unit operations in more than one sector, the sum of facilities by sector exceeds the total number of facilities that discharge wastewater (44,000).

[b] Technical surveys for these facilities did not include sector information; therefore, they were listed separately for this table.

[c] These industrial sectors are not included in the final rule.

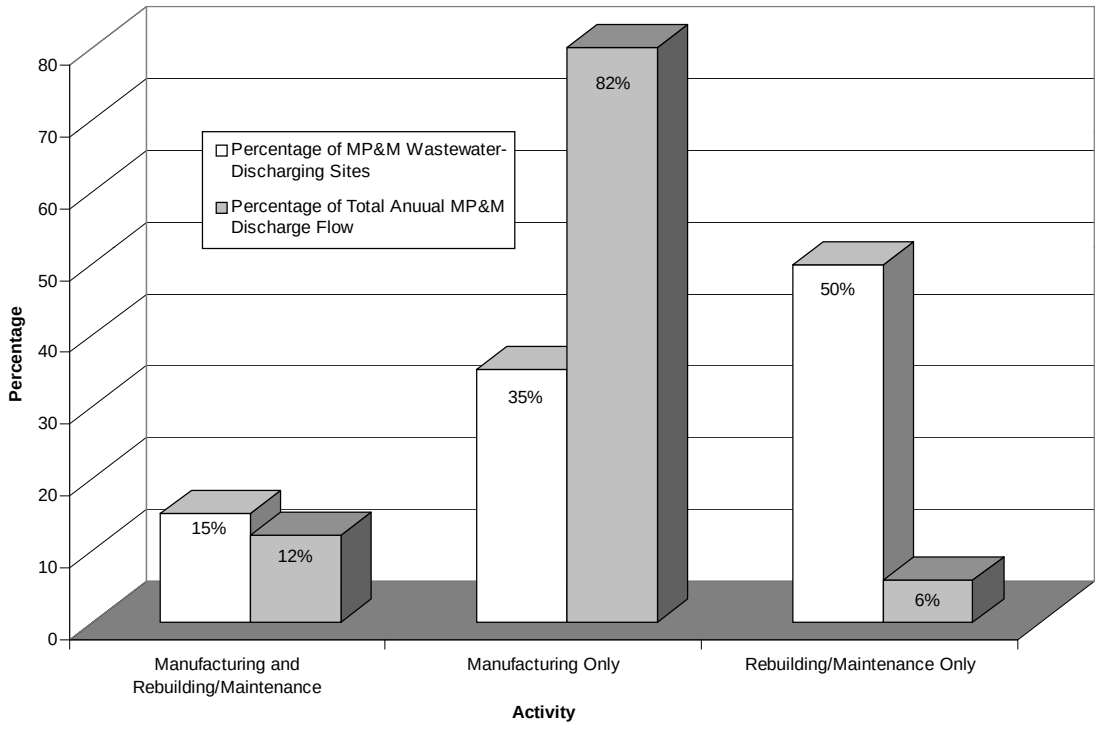
In addition to description by industrial sector, MP&M operations[2] that were proposed for regulation can be described by two types of activities: manufacturing and rebuilding/maintenance.

- Manufacturing is the series of unit operations necessary to produce metal products, and is generally performed in a production environment.

- Rebuilding/maintenance is the series of unit operations necessary to disassemble used metal products into components, replace the components or subassemblies or restore them to original function, and reassemble the metal products. These operations are intended to keep metal products in operating condition and can be performed in either a production or a nonproduction environment.

Figure 4-3 presents the percentage of wastewater-discharging MP&M facilities and percentage of the total annual wastewater discharge by activity. Eighty-two percent of the annual wastewater discharge is discharged by facilities with only manufacturing operations. These facilities represent 35 percent of the total wastewater-discharging MP&M facilities. The highest percentage of the MP&M facilities (i.e., 50 percent) have only rebuilding and maintenance operations.

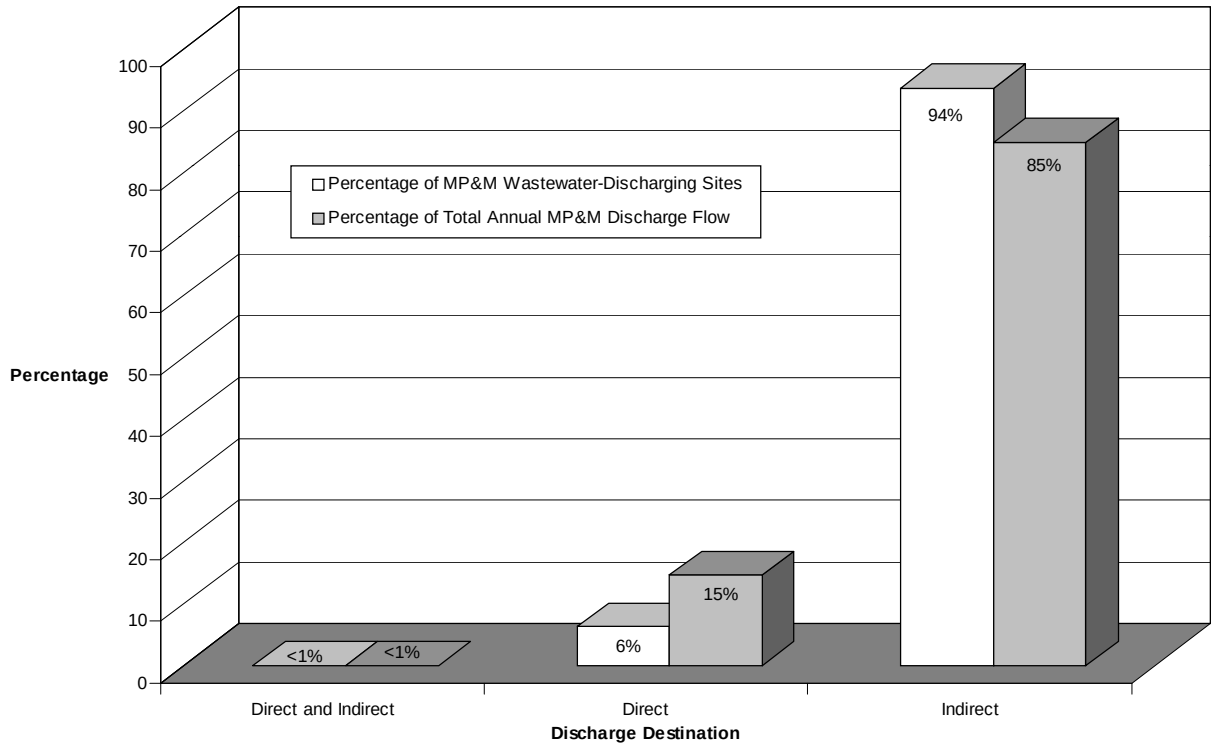
[2]EPA evaluated a number of unit operations for the May 1995 proposal, January 2001 proposal, and June 2002 Notice of Data Availability (NODA) (see Tables 4-3 and 4-4). However, EPA selected a subset of these unit operations for regulation in the final rule (see section 1.0). For this section, the term "proposed MP&M operations" means those operations evaluated for the two proposals, NODA, and final rule. The term "Final MP&M operations" means those operations defined as "oily operations" (see Section 1.0, 40 CFR 438.2(f), and Appendix B to Part 438) and regulated by the final rule.



Source: MP&M Survey Database.
Note: There are 44,000 wastewater-discharging MP&M facilities. Total MP&M wastewater flow is 78.2 billion gallons per year.

Figure 4-3. Percentage of Wastewater-Discharging MP&M facilities and Percentage of Total Annual Discharge by Activity

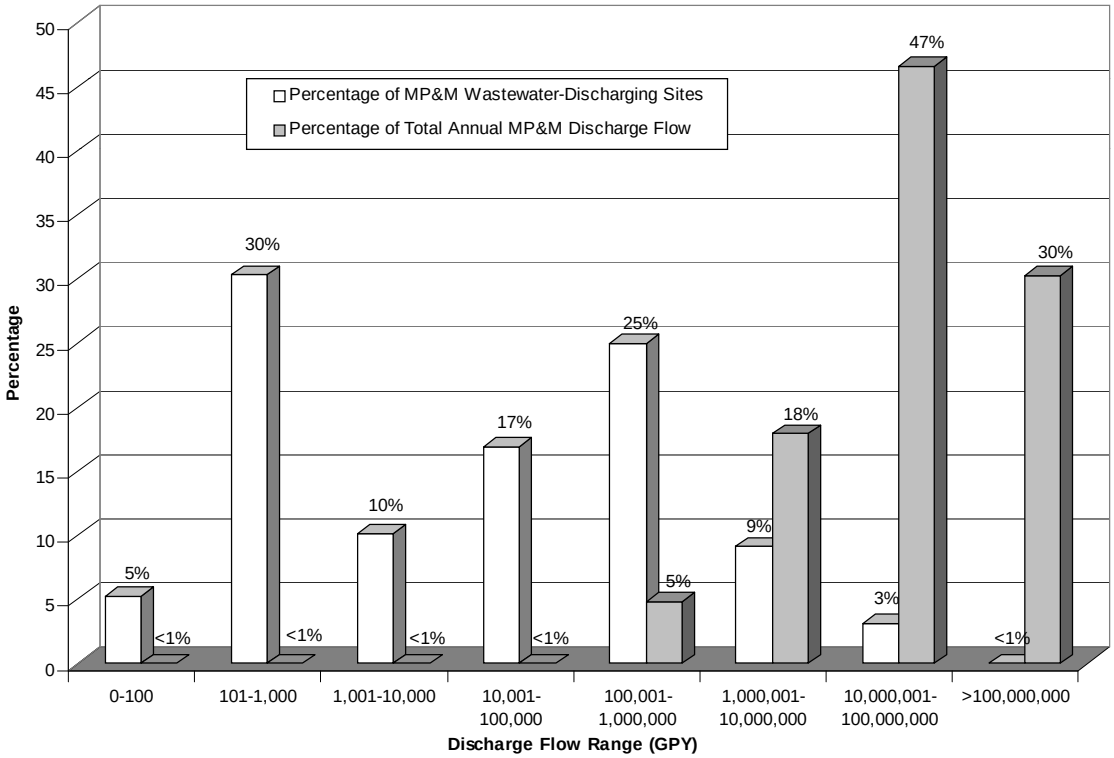
Wastewater-discharging MP&M facilities include direct dischargers, indirect dischargers, and those that are both direct and indirect dischargers. A direct discharger is a facility that discharges wastewater to a surface water (e.g., river, lake, ocean). An indirect discharger is a facility that discharges wastewater to a publicly owned treatment works (POTW). Figure 4-4 presents the percentage of wastewater-discharging MP&M facilities and the percentage of the total annual wastewater discharge by discharge status. This figure shows that the highest percentage of wastewater-discharging MP&M facilities are indirect dischargers, and those facilities account for 85 percent of the total annual discharge from all MP&M facilities.



Source: MP&M Survey Database.
Note: There are 44,000 wastewater-discharging MP&M facilities. Total MP&M wastewater flow is 78.2 billion gallons per year.

Figure 4-4. Percentage of Wastewater-Discharging MP&M facilities and Percentage of Total Annual Discharge by Discharge Status

Wastewater discharge flow rates for MP&M facilities range from less than 100 gallons per year to greater than 100 million gallons per year. Figure 4-5 presents the percentage of wastewater-discharging MP&M facilities and the percentage of the annual MP&M wastewater discharge by range of wastewater flow rates. As this figure shows, MP&M facilities discharging more than one million gallons per year (approximately 12 percent of the total facilities) account for approximately 95 percent of the total annual wastewater discharge for all MP&M facilities. In contrast, facilities discharging less than 100,000 gallons per year (approximately 62 percent of the total facilities) account for less than one percent of the total annual wastewater discharge for all MP&M facilities.



Source: MP&M Survey Database.
Note: There are 44,000 wastewater-discharging MP&M facilities. Total MP&M wastewater flow is 78.2 billion gallons per year.

Figure 4-5. Percentage of Wastewater-Discharging MP&M facilities and Percentage of Total Annual MP&M Discharge by Flow Rate Range

4.1.4 Non-Wastewater-Discharging Facilities

Based on the results of the detailed MP&M surveys, an estimated 13,000 MP&M facilities either generate process water and do not discharge wastewater (i.e., zero discharge or contract haulers) or do not use process water (dry facilities). Information from the MP&M detailed surveys, site visits, and technical literature indicates these facilities achieve zero discharge of process wastewater in one of the following ways:

- Contract haul all process wastewater generated on site;
- Discharge process wastewater to either on-site septic systems or deep-well injection systems;

- Perform end-of-pipe treatment and reuse all process wastewater generated on site;

- Perform either in-process or end-of-pipe evaporation to eliminate wastewater discharges; or

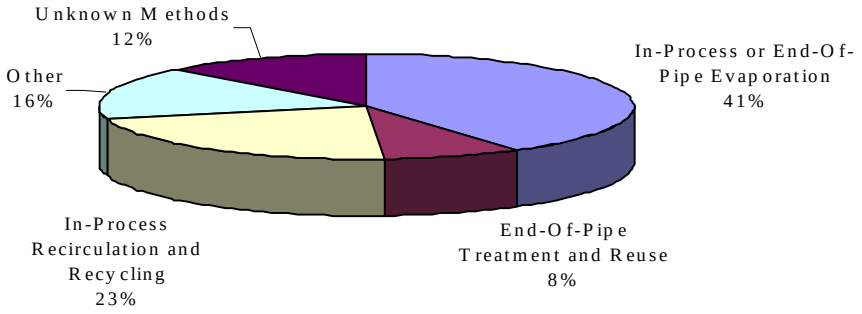
- Perform in-process recirculation and recycling to eliminate wastewater discharges.

As discussed in Section 3.0, EPA mailed the 1989 detailed survey to a probability sample of 50 screener respondents that reported using but not discharging process water. Based on the survey responses, 5 of these facilities contract hauled all wastewater generated on site, 8 actually discharged process wastewater, 18 had no process wastewater discharges, and 19 were not engaged in proposed MP&M operations. The Agency also mailed the 1989 detailed survey to an additional 24 screener respondents that reported using but not discharging process water. As discussed in Section 3.0, EPA selected these facilities because they performed unit operations that were not expected to be characterized sufficiently by detailed surveys mailed to other facilities. Of the additional 24, 14 actually discharged process wastewater, 2 had no process wastewater discharges, and 8 were not engaged in proposed MP&M operations. Of the 74 screener respondents that received the 1989 detailed survey, only 20 reported no discharge of process water.

In addition to the 20 facilities discussed above that do not discharge process wastewater, 205 of the 1996 screener survey respondents reported eliminating wastewater discharges by in-process or end-of-pipe evaporation, end-of-pipe treatment and reuse, in-process recirculation and recycling, or other unspecified means. Figure 4-6 shows the percentage of the facilities using each type of zero discharge method. Note that Figure 4-6 provides the percentage of survey respondents, not industry percentages, because this information was available for only a subset of the industry. The methods used by the 225 survey facilities to eliminate wastewater discharges are discussed below.

In-Process or End-Of-Pipe Evaporation. Forty-one percent of the screener survey respondents (i.e., 92 respondents) reported discharging wastewater to either evaporators, on-site ponds, or lagoons to evaporate process wastewater. None of these facilities reported recovering the process wastewater. Facilities reported contracting for off-site disposal of sludge from the evaporation units.

End-Of-Pipe Treatment and Reuse. Eight percent of the screener survey respondents (i.e., 18 respondents) reported eliminating wastewater discharges through end-of-pipe treatment and reuse of all wastewater generated on site.



Note: There are 225 survey facilities that have eliminated wastewater discharge.

Figure 4-6. Percentage of Screener Survey Respondents Using Each Zero Discharge Method

In-Process Recirculation and Recycling. Twenty-three percent of the screener survey respondents (i.e., 52 respondents) reported eliminating wastewater discharges through in-process recirculation and recycling. Several facilities used a stagnant bath in their heat treating operations. Some facilities used stagnant baths in their surface finishing operations (e.g., alkaline cleaning and chemical conversion coating). Make-up water is added to the stagnant baths to account for losses of bath water through evaporation.

Other. Sixteen percent of the screener survey respondents (i.e., 36 respondents) reported eliminating wastewater discharge through a variety of other methods including land application and septic tank systems or contract hauling through a centralized waste treater (CWT) or privately owned treatment works (PrOTW).

4.2 Proposed MP&M Operations

This subsection discusses the proposed MP&M operations and presents a brief description of each unit operation. It also discusses the metals processed in proposed MP&M operations, and presents an estimate of the annual wastewater discharge for each proposed MP&M operations.

4.2.1 Types of Unit Operations

MP&M facilities perform several different types of unit operations and associated rinses on metal parts, products, and machines. Section 4.2.2 describes these unit operations.

The types of proposed MP&M operations include:

- Metal shaping;
- Surface preparation;
- Metal deposition;
- Organic material deposition;
- Surface finishing;
- Assembly;
- Dry dock; and
- Specialized printed wiring board operations.

Metal shaping is a mechanical operation that alters the form of raw materials into intermediate and final products. Surface preparation includes chemical and mechanical operations that remove unwanted materials from or alter the chemical or physical properties of the part surface prior to subsequent proposed MP&M operations. Metal deposition applies a metal coating to the part surface by chemical or physical means. Organic material deposition applies an organic material to the part by chemical or physical means. Facilities may perform metal and organic material deposition to protect the surface from wear or corrosion, modify the electrical properties of the surface, or alter the appearance of the surface. Surface finishing protects and seals the surface of the treated part from wear or corrosion by chemical means. Facilities also may use surface finishing to alter the appearance of the part surface. Assembly is performed throughout the manufacturing, rebuilding, or maintenance process. Dry dock operations are proposed MP&M operations performed at ship and boat facilities within dry docks or similar structures and incorporate many types of proposed MP&M operations. Printed wiring board unit operations are those specific to the manufacture or rebuilding/maintenance of wiring boards (e.g., carbon black deposition, solder flux cleaning, and photo image developing). Specialized printed wiring board operations do not include those performed at assembly-only facilities. Table 4-2 lists examples of the different types of proposed MP&M operations.

Table 4-2

Types of Proposed MP&M operations

Type of Unit Operations	Example
Metal Shaping	Machining, Grinding, Deformation
Surface Preparation	Alkaline Cleaning, Acid Treatment
Metal Deposition	Electroplating, Vapor Deposition
Organic Material Deposition	Painting
Surface Finishing	Chemical Conversion Coating
Assembly	Testing (e.g., leak testing), Assembly
Dry Dock	Welding
Specialized Printed Wiring Board	Solder Leveling, Photoresist Applications

At a given MP&M facility, the specific unit operations and the sequence of operations depend on many factors, including the activity at the facility (i.e., manufacturing, rebuilding/maintenance), industrial sector, and type of product processed. As a result, MP&M facilities perform many different combinations and sequences of unit operations. For example, MP&M facilities that repair, rebuild or maintain products often conduct preliminary operations that may not be performed at manufacturing facilities (e.g., disassembly, cleaning, or degreasing to remove dirt and oil accumulated during use of the product). In general, however, MP&M products are processed in the following order:

- The raw material (e.g., bar stock, wire, rod, sheet stock, plates) undergoes some type of metal-shaping process, such as impact or pressure deformation, machining, or grinding. In these operations, the raw material is shaped into intermediate forms for further processing or into final forms for assembly and shipment to the customer. Facilities typically clean and degrease the parts between some of the shaping operations to remove lubricants, coolants, and metal fines. Facilities also may heat a part between shaping operations to alter its physical characteristics.

- After shaping, the part typically undergoes some type of surface preparation, such as alkaline cleaning, acid treatment (pickling), or barrel finishing. The specific operation depends on the subsequent unit operations and the final use of the products. For example, prior to electroplating, parts typically go through acid pickling (i.e., acid cleaning) to prepare the part surface for electroplating. Before assembly, parts typically go through alkaline cleaning or barrel finishing. Parts go through surface preparation at various stages of the production process. Additional cleaning and degreasing steps precede metal deposition, organic material deposition, surface finishing, and assembly.

- Metal and organic material deposition typically follow shaping and surface preparation, and precede surface finishing and final assembly. For example, electroplating usually follows alkaline and acid treatment, while painting usually follows phosphate conversion coating and alkaline treatment.

- Surface finishing operations typically are performed after shaping and surface preparation. Some surface finishing is performed after metal deposition. For example, chromate conversion coating typically follows acid cleaning, although this operation is sometimes performed as a sealant operation after electroplating (e.g., chemical conversion coating of cadmium plated parts). Surface finishing also is done prior to applying organic coatings. For example, phosphate conversion coating frequently precedes painting to enhance the paint adhesion.

- Disassembly may be the first step in the rebuilding process. Assembly, on the other hand, is done during many steps of the manufacturing and rebuilding process to prepare the final product. Assembly also may involve some final shaping (e.g., drilling and grinding) and surface preparation (e.g., alkaline cleaning). Final assembly usually is the last operation prior to shipment to the customer.

Some MP&M facilities conduct all of these types of unit operations in manufacturing or rebuilding products, while others may perform only some types. For example, a facility that manufactures products used in the hardware sector may start with bar stock and manufacture a final hardware product, performing machining, cleaning, electroplating, conversion coating, painting, degreasing, and assembly. Another hardware product manufacturing facility may only clean and paint the parts. A third hardware product manufacturing facility may only shape the parts, and perform only machining, cleaning, and degreasing operations.

4.2.2 Description of Proposed MP&M Operations

EPA described the operations above as either metal-bearing operations or oily operations. This section describes each of the MP&M operations for which EPA considered new regulations. Oily operations (as defined in 40 CFR 438.2(f)) are listed in Table 4-3. Metal-bearing operations (as defined in 40 CFR 438.2(d)) are listed in Table 4-4.

Table 4-3

List of MP&M Oily Operations

• Abrasive Blasting	• Iron Phosphate Conversion Coating
• Adhesive Bonding	• Machining
• Alkaline Cleaning for Oil Removal	• Painting-spray or Brush (Including Water Curtains)
• Alkaline Treatment Without Cyanide	• Polishing
• Aqueous Degreasing	• Pressure Deformation
• Assembly/Disassembly	• Solvent Degreasing
• Burnishing	• Steam Cleaning
• Calibration	• Testing (e.g., Hydrostatic, Dye Penetrant, Ultrasonic, Magnetic Flux)
• Corrosion Preventive Coating	
• Electrical Discharge Machining	• Thermal Cutting
• Floor Cleaning (In Process Area)	• Tumbling/Barrel Finishing/Mass Finishing/Vibratory Finishing
• Grinding	• Washing (Finished Products)
• Heat Treating	• Welding
• Impact Deformation	• Wet Air Pollution Control for Organic Constituents

Note: This list is replicated at 40 CFR 438.2(f) with definitions at Appendix B to Part 438.

Table 4-4

List of MP&M Metal-Bearing Operations

• Abrasive Jet Machining	• Mechanical and Vapor Plating
• Acid Pickling Neutralization	• Metallic Fiber Cloth Manufacturing
• Acid Treatment With Chromium	• Metal Spraying (including Water Curtain)
• Acid Treatment Without Chromium	• Painting-immersion (including Electrophoretic, "E-coat")
• Alcohol Cleaning	• Photo Imaging
• Alkaline Cleaning Neutralization	• Photo Image Developing
• Alkaline Treatment With Cyanide	• Photoresist Application
• Anodizing With Chromium	• Photoresist Strip
• Anodizing Without Chromium	• Phosphor Deposition
• Carbon Black Deposition	• Physical Vapor Deposition
• Catalyst Acid Pre-dip	• Plasma Arc Machining
• Chemical Conversion Coating Without Chromium	• Plastic Wire Extrusion
• Chemical Milling (or Chemical Machining)	• Salt Bath Descaling
• Chromate Conversion Coating (or Chromating)	• Shot Tower - Lead Shot Manufacturing
• Chromium Drag-out Destruction	• Soldering
• Cyanide Drag-out Destruction	• Solder Flux Cleaning
• Cyaniding Rinse	• Solder Fusing
• Electrochemical Machining	• Solder Masking
• Electroless Catalyst Solution	• Sputtering
• Electroless Plating	• Stripping (paint)
• Electrolytic Cleaning	• Stripping (metallic coating)
• Electroplating With Chromium	• Thermal Infusion
• Electroplating With Cyanide	• Ultrasonic Machining
• Electroplating Without Chromium or Cyanide	• Vacuum Impregnation
• Electropolishing	• Vacuum Plating
• Galvanizing/Hot Dip Coating	• Water Shedder
• Hot Dip Coating	• Wet Air Pollution Control
• Kerfing	• Wire Galvanizing Flux
• Laminating	

Note: This list is replicated at 40 CFR 438.2(d) with definitions at Appendix C to Part 438.

EPA also evaluated process wastewater from "Bilge Water" and "Dry Dock/Stormwater" for the final rule. These two processes generate mainly oily or organic wastewater but are not included in the final definition of "oily operations" (as defined in 40 CFR 438.2(f)) as these unit operations only occur at facilities EPA decided should not be subject to the final rule (see 40 CFR 438.1(e)(5)). EPA used the following definitions for "Bilge Water" and "Dry Dock/Stormwater" for the final rule:

- **Bilge Water** is water that collects in the inner hull of a ship. When a ship is in a dry dock or similar structure, the bilge water is collected and then treated and disposed of.

- **Dry Dock/Stormwater**. Maintenance operations performed on a ship/boat in a dry dock that either use process water or are exposed to stormwater.

The following descriptions are provided to aid the reader in understanding the described processes and do not supersede regulatory definitions of unit operations in the final MP&M rule. Moreover, the definitions in this section should not be used to differentiate between the six "core" metal finishing operations (i.e., Electroplating, Electroless Plating, Anodizing, Coating (chromating, phosphating, and coloring), Chemical Etching and Milling, and Printed Circuit Board Manufacture) and 40 "ancillary" process operations listed at 40 CFR 433.10(a).

4.2.2.1 Description of MP&M Oily Operations

Abrasive Blasting involves removing surface film from a part by using abrasive directed at high velocity against the part. Abrasive blasting includes bead, grit, shot, and sand blasting, and may be performed either dry or with water. The primary applications of wet abrasive blasting include: removing burrs on precision parts; producing satin or matte finishes; removing fine tool marks; and removing light mill scale, surface oxide, or welding scale. Wet blasting can be used to finish fragile items such as electronic components. Also, some aluminum parts are wet blasted to achieve a fine-grained matte finish for decorative purposes. In abrasive blasting, the water and abrasive typically are reused until the particle size diminishes due to impacting and fracture.

Adhesive Bonding involves joining parts using an adhesive material. Typically, an organic bonding compound is used as the adhesive. This operation usually is dry; however, aqueous solutions may be used as bonding agents or to contain residual organic bonding materials.

Alkaline Cleaning for Oil Removal is a general term for the application of an alkaline cleaning agent to a metal part to remove oil and grease during the manufacture, maintenance, or rebuilding of a metal product.

This unit operation does not include washing of the finished products after routine use (as defined in "Washing (Finished Products)" in this subsection), or applying an alkaline cleaning

agent to remove nonoily contaminants such as dirt and scale (as defined in "Alkaline Treatment Without Cyanide" in this subsection and "Alkaline Treatment With Cyanide" in Section 4.2.2.2). Wastewater generated includes spent cleaning solutions and rinse waters.

- **Alkaline cleaning** is performed to remove foreign contaminants from parts. This operation usually is done prior to finishing (e.g., electroplating).

- **Emulsion cleaning** is an alkaline cleaning operation that uses either complex chemical enzymes or common organic solvents (e.g., kerosene, mineral oil, glycols, and benzene) dispersed in water with the aid of an emulsifying agent. The pH of the solvent usually is between 7 and 9, and, depending on the solvent used, cleaning is performed at temperatures from room temperature to 82°C (180°F). This operation often is used as a replacement for vapor degreasing.

Alkaline Treatment Without Cyanide is a general term used to describe the application of an alkaline solution not containing cyanide to a metal surface to clean the metal surface or prepare the metal surface for further surface finishing.

Aqueous Degreasing involves cleaning metal parts using aqueous-based cleaning chemicals primarily to remove residual oils and greases from the part. Residual oils can be from previous operations (e.g., machine coolants), oil from product use in a dirty environment, or oil coatings used to inhibit corrosion. Wastewater generated by this operation includes spent cleaning solutions and rinse waters.

Assembly/Disassembly involves fitting together previously manufactured or rebuilt parts or components into a complete metal product or machine or taking a complete metal product or machine apart. Assembly/disassembly operations are typically dry; however, special circumstances can require water for cooling or buoyancy. Also, rinsing may be necessary under some conditions.

Burnishing involves finish sizing or smooth finishing a part (previously machined or ground) by displacing, rather than removing, minute surface irregularities with smooth point or line-contact, fixed or rotating tools. Lubricants or soap solutions can be used to cool the tools used in burnishing operations. Wastewater generated during burnishing include process solutions and rinse water.

Calibration is performed to provide reference points for the use of a product. This unit operation typically is dry, although water may be used in some cases (e.g., pumping water for calibration of a pump). Water used in this unit operation usually does not contain additives.

Corrosion Preventive Coating involves applying removable oily or organic solutions to protect metal surfaces against corrosive environments. Corrosion preventive coatings include, but are not

limited to: petrolatum compounds, oils, hard dry-film compounds, solvent-cutback petroleum-based compounds, emulsions, water-displacing polar compounds, and fingerprint removers and neutralizers. Corrosion preventive coating does not include electroplating or chemical conversion coating operations.

Many corrosion preventive materials also are formulated to function as lubricants or as a base for paint. Typical applications include: assembled machinery or equipment in standby storage; finished parts in stock or spare parts for replacement; tools such as drills, taps, dies, and gauges; and mill products such as sheet, strip, rod and bar.

Wastewater generated during corrosion preventive coating includes spent process solutions and rinses. Process solutions are discharged when they become contaminated with impurities or are depleted of constituents. Corrosion preventive coatings typically do not require an associated rinse, but parts are sometimes rinsed to remove the coating before further processing.

Electrical Discharge Machining involves removing metals by a rapid spark discharge between different polarity electrodes, one the part and the other the tool, separated by a small gap. The gap may be filled with air or a dielectric fluid. This operation is used primarily to cut tool alloys, hard nonferrous alloys, and other hard-to-machine materials. Most electrical discharge machining processes are operated dry; however, in some cases, the process uses water and generates wastewater containing dielectric fluid.

Floor Cleaning (in Process Area) removes dirt, debris, and process solution spills from process area floors. Floors can be cleaned using wet or dry methods, such as vacuuming, mopping, dry sweeping, and hose rinsing. Nonprocess area floor cleaning in offices and other similar nonprocess areas is not included in this unit operation.

Grinding involves removing stock from a part by using abrasive grains held by a rigid or semirigid binder. Grinding shapes or deburrs the part. The grinding tool usually is a disk (the basic shape of grinding wheels), but can also be a cylinder, ring, cup, stick, strip, or belt. The most commonly used abrasives are aluminum oxide, silicon carbide, and diamond. The process may use a grinding fluid to cool the part and remove debris or metal fines.

Wastewater generated during grinding includes spent coolants and rinses. Metal-working fluids become spent for a number of reasons, including increased biological activity (i.e., the fluids become rancid) or decomposition of the coolant additives. Rinse waters typically are assimilated into the working fluid or treated on site.

Heat Treating involves modifying the physical properties of a part by applying controlled heating and cooling cycles. This operation includes tempering, carburizing, cyaniding, nitriding, annealing, aging, normalizing, austenitizing, austempering, siliconizing, martempering, and malleablizing. Parts are heated in furnaces or molten salt baths, and then may be cooled by quenching in aqueous solutions (e.g., brine solutions), neat oils (pure oils with little or no impurities), or oil/water emulsions. Heat treating typically is a dry operation, but is considered a

wet operation if aqueous quenching solutions are used. Wastewater includes spent quench water and rinse water.

Impact Deformation involves applying impact force to a part to permanently deform or shape it. Impact deformation may include mechanical processes such as hammer forging, shot peening, peening, coining, high-energy-rate forming, heading, or stamping.

Natural and synthetic oils, light greases, and pigmented lubricants are used in impact deformation operations. Pigmented lubricants include whiting, lithapone, mica, zinc oxide, molybdenum disulfide, bentonite, flour, graphite, white lead, and soap-like materials.

These operations typically are dry, but wastewater can be generated from lubricant discharge and from rinsing operations associated with the operation.

Iron Phosphate Conversion Coating is the process of applying a protective coating on the surface of a metal using a bath consisting of a phosphoric acid solution containing no metals (e.g., manganese, nickel, or zinc) or a phosphate salt solution (i.e., sodium or potassium salts of phosphoric acid solutions) containing no metals (e.g., manganese, nickel, or zinc) other than sodium or potassium. Any metal concentrations in the bath are from the substrate.

Machining involves removing stock from a part (as chips) by forcing a cutting tool against the part. This includes machining processes such as turning, milling, drilling, boring, tapping, planing, broaching, sawing, shaving, shearing, threading, reaming, shaping, slotting, hobbing, and chamfering. Machining processes use various types of metal-working fluids, the choice of which depends on the type of machining being performed and the preference of the machine shop. The fluids can be categorized into four groups: straight oil (neat oils), synthetic, semisynthetic, and water-soluble oil.

Machining operations generate wastewater from working fluid or rinse water discharge. Metal-working fluids periodically are discarded because of reduced performance or development of a rancid odor. After machining, parts are sometimes rinsed to remove coolant and metal chips. The coolant reservoir is sometimes rinsed, and the rinse water is added to the working fluid.

Painting - Spray or Brush (Including Water Curtains) involves applying an organic coating to a part. Coatings such as paint, varnish, lacquer, shellac, and plastics are applied by spraying, brushing, roll coating, lithographing, powder coating, and wiping.

Water is used in painting operations as a solvent (water-borne formulations) for rinsing, for cleanup, and for water-wash (or curtain) type spray booths. Paint spray booths typically use most of the water in this unit operation. Spray booths capture overspray (i.e., paint that misses the product during application), and control the introduction of pollutants into the workplace and environment.

Polishing involves removing stock from a part using loose or loosely held abrasive grains carried to the part by a flexible support. Usually, the objective is to achieve a desired surface finish or appearance rather than to remove a specified amount of stock. Buffing is included in this unit operation, and usually is performed using a revolving cloth or sisal buffing wheel, which is coated with a suitable compound. Liquid buffing compounds are used extensively for large-volume production on semiautomated or automated buffing equipment. Polishing operations typically are dry, although liquid compounds and associated rinses are used in some polishing processes.

Pressure Deformation involves applying force (other than impact force) to permanently deform or shape a part. Pressure deformation may include rolling, drawing, bending, embossing, sizing, extruding, squeezing, spinning, necking, forming, crimping or flaring.

These operations use natural and synthetic oils, light greases, and pigmented lubricants. Pigmented lubricants include whiting, lithapone, mica, zinc oxide, molybdenum disulfide, bentonite, flour, graphite, white lead, and soap-like materials.

Pressure deformation typically is dry, but wastewater is sometimes generated from the discharge of lubricants or from rinsing associated with the process.

Solvent Degreasing removes oils and grease from the surface of a part using organic solvents, including aliphatic petroleum (e.g., kerosene, naphtha), aromatics (e.g., benzene, toluene), oxygenated hydrocarbons (e.g., ketones, alcohol, ether), and halogenated hydrocarbons (e.g., 1,1,1-trichloroethane, trichloroethylene, methylene chloride).

Solvent cleaning takes place in either the liquid or vapor phase. Solvent vapor degreasing normally is quicker than solvent liquid degreasing. However, ultrasonic vibration is sometimes used with liquid solvents to decrease the required immersion time of complex shapes. Solvent cleaning often is used as a precleaning operation prior to alkaline cleaning, as a final cleaning of precision parts, or as surface preparation for some painting operations. Solvent degreasing operations typically are not followed by rinsing, although rinsing is performed in some cases.

Steam Cleaning removes residual dirt, oil, and grease from parts after processing though other unit operations. Typically, additives are not used in this operation; the hot steam removes the pollutants. Wastewater is generated when the cleaned parts are rinsed.

Testing (e.g., hydrostatic, dye penetrant, ultrasonic, magnetic flux) involves applying thermal, electrical, mechanical, hydraulic, or other energy to determine the suitability or functionality of a part, assembly, or complete unit. Testing also may include applying surface penetrant dyes to detect surface imperfections. Other examples of tests frequently performed include electrical testing, performance testing, and ultrasonic testing; these tests typically are dry but may generate wastewater under certain circumstances. Testing usually is performed to replicate some aspect of the working environment. Wastewater generated during testing includes spent process solutions and rinses.

Thermal Cutting involves cutting, slotting, or piercing a part using an oxy-acetylene oxygen lance, electric arc cutting tool, or laser. Thermal cutting typically is a dry process, except for the use of contact cooling waters and rinses.

Tumbling/Barrel Finishing/Mass Finishing/Vibratory Finishing involves polishing or deburring a part using a rotating or vibrating container and abrasive media or other polishing materials to achieve a desired surface appearance. Parts to be finished are placed in a rotating barrel or vibrating unit with an abrasive media (e.g., ceramic chips, pebbles), water, and chemical additives (e.g., alkaline detergents). As the barrel rotates, the upper layer of the part slides toward the lower side of the barrel, causing the abrading or polishing. Similar results can be achieved in a vibrating unit, where the entire contents of the container are in constant motion, or in a centrifugal unit, which compacts the load of media and parts as the unit spins and generates up to 50 times the force of gravity. Spindle finishing is a similar process, where parts to be finished are mounted on fixtures and exposed to a rapidly moving abrasive slurry.

Wastewater generated during barrel finishing includes spent process solutions and rinses. Following the finishing process, the contents of the barrel are unloaded. Process wastewater is either discharged continuously during the process, discharged after finishing, or collected and reused. The parts are sometimes given a final rinse to remove particles of abrasive media.

Washing (Finished Products) involves cleaning finished metal products after use or storage using fresh water or water containing a mild cleaning solution. This unit operation applies only to the finished products that do not require maintenance or rebuilding.

Welding involves joining two or more pieces of material by applying heat, pressure, or both, with or without filler material, to produce a metallurgical bond through fusion or recrystallization across the interface. This includes gas welding, resistance welding, arc welding, cold welding, electron beam welding, and laser beam welding. Welding typically is a dry process, except for the occasional use of contact cooling waters or rinses.

Wet Air Pollution Control for Organic Constituents involves using water to remove organic constituents that are entrained in air streams exhausted from process tanks or production areas. Most frequently, wet air pollution control devices are used with cleaning and coating processes. A common type of wet air pollution control is the wet packed scrubber consisting of a spray chamber that is filled with packing material. Water is continuously sprayed onto the packing and the air stream is pulled through the packing by a fan. Pollutants in the air stream are absorbed by the water droplets and the air is released to the atmosphere. A single scrubber often serves numerous process tanks.

4.2.2.2 Description of MP&M Metal-bearing Operations

Abrasive Jet Machining includes removing stock material from a part by a high-speed stream of abrasive particles carried by a liquid or gas from a nozzle. Abrasive jet machining is used for deburring, drilling, and cutting thin sections of metal or composite material. Unlike abrasive

blasting, this process operates at pressures of thousands of pounds per square inch. The liquid streams typically are alkaline or emulsified oil solutions, although water also can be used.

Acid Pickling Neutralization involves using a dilute alkaline solution to raise the pH of acid pickling rinse water that remains on the part after pickling. The wastewater from this operation is the acid pickling neutralization rinse water.

Acid Treatment With Chromium is a general term used to describe any application of an acid solution containing chromium to a metal surface. Acid cleaning, chemical etching, and pickling are types of acid treatment.

Chromic acid is used occasionally to clean cast iron, stainless steel, cadmium and aluminum, and bright dipping of copper and copper alloys. Also, chromic acid solutions can be used for the final step in acid cleaning phosphate conversion coating systems. Chemical conversion coatings formulated with chromic acid are defined at “Chromate Conversion Coating (or Chromating)” in this subsection.

Wastewater generated during acid treatment includes spent solutions and rinse waters. Spent solutions typically are batch discharged and treated or disposed of off site. Most acid treatment operations are followed by a water rinse to remove residual acid.

Acid Treatment Without Chromium is a general term used to describe any application of an acid solution not containing chromium to a metal surface. Acid cleaning, chemical etching, and pickling are types of acid treatment.

Wastewater generated during acid treatment includes spent solutions and rinse waters. Spent solutions typically are batch discharged and treated or disposed of off site. Most acid treatment operations are followed by a water rinse to remove residual acid.

Alcohol Cleaning involves removing dirt and residue material from a part using alcohol.

Alkaline Cleaning Neutralization involves using a dilute acid solution to lower the pH of alkaline cleaning rinse water that remains on the part after alkaline cleaning. Wastewater from this operation is the alkaline cleaning neutralization rinse water.

Alkaline Treatment With Cyanide is the cleaning of a metal surface with an alkaline solution containing cyanide.

Wastewater generated during alkaline treatment includes spent solutions and rinse waters. Alkaline treatment solutions become contaminated from the introduction of soils and dissolution of the base metal. They usually are treated and disposed of on a batch basis. Alkaline treatment typically is followed by a water rinse that is discharged to a treatment system.

Anodizing With Chromium involves producing a protective oxide film on aluminum, magnesium, or other light metal, usually by passing an electric current through an electrolyte bath in which the metal is immersed. Anodizing may be followed by a sealant operation.

Chromic acid anodic coatings have a relatively thick boundary layer and are more protective than are sulfuric acid coatings. For these reasons, chromic acid is sometimes used when the part cannot be rinsed completely. These oxide coatings provide corrosion protection, decorative surfaces, a base for painting and other coating processes, and special electrical and mechanical properties.

Wastewaters generated during anodizing include spent anodizing solutions, sealants, and rinse waters. Because of the anodic nature of the process, anodizing solutions become contaminated with the base metal being processed. These solutions eventually reach an intolerable concentration of dissolved metal and require treatment or disposal. Rinse water following anodizing, coloring, and sealing typically is discharged to a treatment system.

Anodizing Without Chromium involves applying a protective oxide film to aluminum, magnesium, or other light metal, usually by passing an electric current through an electrolyte bath in which the metal is immersed. Phosphoric acid, sulfuric acid, and boric acid are used in anodizing. Anodizing also may include sealant baths. These oxide coatings provide corrosion protection, decorative surfaces, a base for painting and other coating processes, and special electrical and mechanical properties.

Wastewater generated during anodizing includes spent anodizing solutions, sealants, and rinse waters. Because of the anodic nature of the process, anodizing solutions become contaminated with the base metal being processed. These solutions eventually reach an intolerable concentration of dissolved metal and require treatment or disposal. Rinse water following anodizing, coloring, and sealing steps typically is discharged to a treatment systems.

Carbon Black Deposition involves coating the inside of printed circuit board holes by dipping the circuit board into a tank that contains carbon black and potassium hydroxide. After excess solution dips from the circuit boards, they are heated to allow the carbon black to adhere to the board.

Catalyst Acid Pre-Dip uses rinse water to remove residual solution from a part after the part is processed in an acid bath. The wastewater generated in this unit operation is the rinse water.

Chemical Conversion Coating without Chromium is the process of applying a protective coating on the surface of a metal without using chromium. Such coatings are applied through phosphate conversion (except for “Iron Phosphate Conversion Coating,” see section 4.2.2.1), metal coloring, or passivation. Coatings are applied to a base metal or previously deposited metal to increase corrosion protection and lubricity, prepare the surface for additional coatings, or formulate a special surface appearance. This unit process includes sealant operations that use additives other than chromium.

- **In phosphate conversion**, coatings are applied for one or more of the following reasons: to provide a base for paints and other organic coatings; to condition surfaces for cold forming operations by providing a base for drawing compounds and lubricants; to impart corrosion resistance to the metal surface; or to provide a suitable base for corrosion-resistant oils or waxes. Phosphate conversion coatings are formed by immersing a metal part in a dilute solution of phosphoric acid, phosphate salts, and other reagents.

- **Metal coloring** by chemical conversion coating produces a large group of decorative finishes. Metal coloring includes the formation of oxide conversion coatings. In this operation, the metal surface is converted into an oxide or similar metallic compound, giving the part the desired color. The most common colored finishes are used on copper, steel, zinc, and cadmium.

- **Passivation** forms a protective coating on metals, particularly stainless steel, by immersing the part in an acid solution. Stainless steel is passivated to dissolve embedded iron particles and to form a thin oxide film on the surface of the metal.

Wastewater generated during chemical conversion coating includes spent solutions and rinses (i.e., both the chemical conversion coating solutions and post-treatment sealant solutions). These solutions commonly are discharged to a treatment system when contaminated with the base metal or other impurities. Rinsing normally follows each process step, except when a sealant dries on the part surface.

Chemical Milling (or Chemical Machining) involves removing metal from a part by controlled chemical attack, or etching, to produce desired shapes and dimensions. In chemical machining, a masking agent typically is applied to cover a portion of the part's surface; the exposed (unmasked) surface is then treated with the chemical machining solution.

Wastewater generated during chemical machining includes spent solutions and rinses. Process solutions typically are discharged after becoming contaminated with the base metal. Rinsing normally follows chemical machining.

Chromate Conversion Coating (or Chromating) involves forming a conversion coating (protective coating) on a metal by immersing or spraying the metal with a hexavalent chromium compound solution to produce a hexavalent or trivalent chromium compound coating. This also is known as chromate treatment, and is most often applied to aluminum, zinc, cadmium or magnesium surfaces. Sealant operations using chromium also are included in this unit operation.

Chromate solutions include two types: (1) those that deposit substantial chromate films on the substrate metal and are complete treatments themselves, and (2) those that seal or supplement oxide, phosphate, or other types of protective coatings.

Wastewater generated during chromate conversion coating includes spent process solutions (i.e., both the chromate conversion coating solutions and post-treatment sealant solutions) and rinses. These solutions typically are discharged to a treatment system when contaminated with the base metal or other impurities. Also, chromium-based solutions, which are typically formulated with hexavalent chromium, lose operating strength when the hexavalent chromium reduces to trivalent chromium during use. Rinsing normally follows each process step, except for sealants that dry on the surface of the part.

Chromium Drag-out Destruction is a unit operation performed following chromium-bearing operations to reduce hexavalent chromium that is "dragged out" of the process bath. Parts are dipped in a solution of a chromium-reducing chemical (e.g., sodium metabisulfite) to prevent the hexavalent chromium from contaminating subsequent process baths. This operation typically is performed in a stagnant drag-out rinse tank that contains concentrated chromium-bearing wastewater.

Cyanide Drag-out Destruction involves dipping the part in a cyanide oxidation solution (e.g., sodium hypochloride) to prevent cyanide that is "dragged out" of a process bath from contaminating subsequent process baths. This operation typically is performed in a stagnant drag-out rinse tank.

Cyaniding Rinse is generated during cyaniding hardening of a part. The part is heated in a molten salt solution containing cyanide. Wastewater is generated when excess cyanide salt solution is removed from the part in rinse water.

Electrochemical Machining is a process in which the part becomes the anode and a shaped cathode is the cutting tool. By pumping electrolyte between the electrodes and applying a current, metal is rapidly but selectively dissolved from the part. Wastewater generated during electrochemical machining includes spent electrolytes and rinses.

Electroless Catalyst Solution involves adding a catalyst just prior to an electroless plating operation to accelerate the plating operation.

Electroless Plating involves applying a metallic coating to a part using a chemical reduction process in the presence of a catalysis. An electric current is not used in this operations. The metal to be plated onto a part typically is held in solution at high concentrations using a chelating agent. This plates all areas of the part to a uniform thickness regardless of the configuration of the part. Also, an electroless-plated surface is dense and virtually nonporous. Copper and nickel electroless plating operations are the most common.

Sealant operations (i.e., other than hot water dips) following electroless plating are considered separate unit operations if they include any additives.

Wastewater generated during electroless plating includes spent process solutions and rinses. The wastewater contains chelated metals, which require separate preliminary treatment to break the metal chelates prior to conventional chemical precipitation. Rinsing follows most electroless plating processes to remove residual plating solution and prevent contamination of subsequent process baths.

Electrolytic Cleaning involves removing soil, scale, or surface oxides from a part by electrolysis. The part is one of the electrodes and the electrolyte is usually alkaline. Electrolytic alkaline cleaning and electrolytic acid cleaning are the two types of electrolytic cleaning.

- **Electrolytic alkaline cleaning** produces a cleaner surface than do nonelectrolytic methods of alkaline cleaning. This operation uses strong agitation, gas evolution in the solution, and oxidation-reduction reactions that occur during electrolysis. In addition, dirt particles become electrically charged and are repelled from the part surface.

- **Electrolytic acid cleaning** sometimes is used as a final cleaning before electroplating. Sulfuric acid is most frequently used as the electrolyte. As with electrolytic alkaline cleaning, the mechanical scrubbing effect from the evolution of gas enhances the effectiveness of the process.

Wastewater generated during electrolytic cleaning includes spent process solutions and rinses. Electrolytic cleaning solutions become contaminated during use due to the dissolution of the base metal and the introduction of pollutants. The solutions typically are batch discharged for treatment or disposal after they weaken. Rinsing following electrolytic cleaning removes residual cleaner to prevent contamination of subsequent process baths.

Electroplating with Chromium involves producing a chromium metal coating on a surface by electrodeposition. Electroplating provides corrosion protection, wear or erosion resistance, lubricity, electrical conductivity, or decoration.

In electroplating, metal ions in acid, alkaline, or neutral solutions are reduced on the cathodic surfaces of the parts being plated. Metal salts or oxides typically are added to replenish the solutions. Chromium trioxide often is added as a source of chromium.

In addition to water and the metal being deposited, electroplating solutions often contain agents that form complexes with the metal being deposited, stabilizers to prevent hydrolysis, buffers for pH control, catalysts to assist in deposition, chemical aids to dissolve anodes, and miscellaneous ingredients that modify the process to attain specific properties. Sealant operations performed after this operation are considered separate unit operations if they include any additives (i.e., other than hot water dips).

Wastewater generated during electroplating includes spent process solutions and rinses. Electroplating solutions occasionally become contaminated during use due to the base metal dissolving and the introduction of other pollutants, diminishing the effectiveness of the electroplating solutions. Spent concentrated solutions typically are treated to remove pollutants and reused, processed in a wastewater treatment system, or disposed of off site. Rinse waters, including some drag-out rinse tank solutions, typically are treated on site.

Electroplating with Cyanide involves producing metal coatings on a surface by electrodeposition using cyanide. Electroplating provides corrosion protection, wear or erosion resistance, electrical conductivity, or decoration.

In electroplating, metal ions in acid, alkaline, or neutral solutions are reduced on the cathodic surfaces of the parts being plated. The metal ions in solution typically are replenished by dissolving metal from anodes contained in inert wire or metal baskets. Sealant operations performed after this operation are considered separate unit operations if they include any additives (i.e., any sealant operations other than hot water dips).

In addition to water and the metal being deposited, electroplating solutions often contain agents that form complexes with the metal being deposited, stabilizers to prevent hydrolysis, buffers to control pH, catalysts to assist in deposition, chemical aids to dissolve anodes, and miscellaneous ingredients that modify the process to attain specific properties. Cyanide, usually in the form of sodium or potassium cyanide, frequently is used as a complexing agent for zinc, cadmium, copper, and precious metal baths.

Wastewater generated during electroplating includes spent process solutions and rinses. Electroplating solutions occasionally become contaminated during use due to dissolution of the base metal and the introduction of other pollutants, diminishing the performance of the electroplating solutions. Spent concentrated solutions typically are treated to remove pollutants and reused, processed in a wastewater treatment system, or disposed of off site. Rinse waters, including some drag-out rinse tank solutions, typically are treated on site.

Electroplating without Chromium or Cyanide involves the production of metal coatings on a surface by electrodeposition, without using chromium or cyanide. Commonly electroplated metals include nickel, copper, tin/lead, gold, and zinc. Electroplating provides corrosion protection, wear or erosion resistance, lubricity, electrical conductivity, or decoration.

In electroplating, metal ions in acid, alkaline, or neutral solutions are reduced on the cathodic surfaces of the parts being plated. The metal ions in solution typically are replenished by dissolving metal from anodes contained in inert wire or metal baskets. Sealant operations performed after this operation are considered separate unit operations if they include any additives (i.e., any sealant operations other than hot water dips).

In addition to water and the metal being deposited, electroplating solutions often contain agents that form complexes with the metal being deposited, stabilizers to prevent hydrolysis, buffers to

control pH, catalysts to assist in deposition, chemical aids to dissolve anodes, and miscellaneous ingredients that modify the process to attain specific properties.

Wastewater generated during electroplating without chromium or cyanide includes spent process solutions and rinses. Electroplating solutions occasionally become contaminated during use due to dissolution of the base metal and the introduction of other pollutants, diminishing the effectiveness of the electroplating solutions. Spent concentrated solutions typically are treated for pollutant removal and reused, processed in a wastewater treatment system, or disposed of off site. Rinse waters, including some drag-out rinse tank solutions, typically are treated on site.

Electropolishing involves producing a highly polished surface on a part using reversed electrodeposition in which the anode (part) releases some metal ions into the electrolyte to reduce surface roughness. When current is applied, a polarized film forms on the metal surface, through which metal ions diffuse. In this operation, areas of surface roughness on parts serve as high-current density areas and are dissolved at rates greater than the rates for smoother portions of the metal surface.

Metals are electropolished to improve appearance, reflectivity, and corrosion resistance. Base metals processed by electropolishing include aluminum, copper, zinc, low-alloy steel, and stainless steel. Common electrolytes include sodium hydroxide and combinations of sulfuric acid, phosphoric acid, and chromic acid.

Wastewater generated during electropolishing includes spent process solutions and rinses. Eventually, the concentration of dissolved metals increases to the point where the process becomes ineffective. Typically, a portion of the bath is decanted and either fresh chemicals are added or the entire solution is discharged to treatment and replaced with fresh chemicals. Rinsing can involve several steps and can include hot immersion or spray rinses.

Galvanizing/Hot Dip Coating involves using various processes to coat an iron or steel surface with zinc. In hot dipping, a base metal is coated by dipping it into a tank that contains a molten metal.

Hot Dip Coating involves applying a metal coating (usually zinc) to the surface of a part by dipping the part in a molten metal bath. Wastewater is generated in this operation when residual metal coating solution is removed from the part in rinse water.

Kerfing uses a tool to remove small amounts of metal from a product surface. Water and synthetic coolants may be used to lubricate the area between the tool and the metal, to maintain the temperature of the cutting tool, and to remove metal fines from the surface of the part. This operation generates oily wastewater that contains metal fines and dust.

Laminating involves applying a material to a substrate using heat and pressure.

Mechanical and Vapor Plating involves applying a metallic coating to a part. For mechanical plating, the part is rotated in a drum containing a water-based solution, glass beads, and metal powder. In vapor plating, a metallic coating is applied by atomizing the metal and applying an electric charge to the part, which causes the atomized (vapor phase) metal to adhere to the part.

Wastewater generated in this operation includes spent solutions from the process bath and rinse water. Typically, the wastewater contains high concentrations of the applied metal.

Metallic Fiber Cloth Manufacturing involves weaving thin metallic fibers to create a mesh cloth.

Metal Spraying (Including Water Curtain) involves applying a metallic coating to a part by projecting molten or semimolten metal particles onto a substrate. Coatings can be sprayed from rod or wire stock or from powdered material. The process involves feeding the material (e.g., wire) into a flame where it is melted. The molten stock then is stripped from the end of the wire and atomized by a high-velocity stream of compressed air or other gas that propels the material onto a prepared substrate or part.

Metal spraying coatings are used in a wide range of special applications, including: insulating layers in applications such as induction heating coils; electromagnetic interference shielding; thermal barriers for rocket engines; nuclear moderators; films for hot isostatic pressing; and dimensional restoration of worn parts.

Metal spraying is sometimes performed in front of a "water curtain" (a circulated water stream used to trap overspray) or a dry filter exhaust hood that captures the overspray and fumes. With water curtain systems, water is recirculated from a sump or tank. Wastewater is generated when the sump or tank is discharged periodically. Metal spraying typically is not followed by rinsing.

Painting-Immersion (Including Electrophoretic, "E-coat") involves applying an organic coating to a part using processes such autophoretic and electrophoretic painting.

- **Autophoretic Painting** involves applying an organic paint film by electrophoresis when a part is immersed in a suitable aqueous bath.
- **Electrophoretic Painting** is coating a part by making it either anodic or cathodic in a bath that is generally an aqueous emulsion of the organic coating material.
- **Other Immersion Painting** includes all other types of immersion painting such as dip painting.

Water is used in immersion paint operations as a carrier for paint particles and to rinse the part. Aqueous painting solutions and rinses typically are treated through an ultrafiltration system. The concentrate is returned to the painting solution, and the permeate is reused as rinse water. Sites

typically discharge a bleed stream to treatment. The painting solution and rinses are batch discharged periodically to treatment.

Photo Imaging is the process of exposing a photoresist-laden printed wiring board to light to impact the circuitry design to the board. Water is not used in this operation.

Photo Image Developing is an operation in which a water-based solution is used to develop the exposed circuitry in a photoresist-laden printed wiring board. Wastewater generated in this operation includes spent process solution and rinse water.

Photoresist Application is an operation that uses heat and pressure to apply a photoresist coating to a printed wiring board. Water is not used in this operation.

Photoresist Strip involves removing organic photoresist material from a printed wiring board using an acid solution.

Phosphor Deposition is the application of a phosphorescent coating to a part. Wastewater generated in this unit operation includes water used to keep the parts clean and wet while the coating is applied, and rinse water used to remove excess phosphorescent coating from the part.

Physical Vapor Deposition involves physically removing a material from a source through evaporation or sputtering, using the energy of the vapor particles in a vacuum or partial vacuum to transport the removed material, and condensing the removed material as a film onto the surface of a part or other substrate.

Plasma Arc Machining involves removing material or shaping a part by a high-velocity jet of high-temperature, ionized gas. A gas (nitrogen, argon, or hydrogen) is passed through an electric arc, causing the gas to become ionized, and heated to temperatures exceeding 16,650°C (30,000°F). The relatively narrow plasma jet melts and displaces the material in its path. Because plasma arc machining does not depend on a chemical reaction between the gas and the part, and because plasma temperatures are extremely high, the process can be used on almost any metal, including those that are resistant to oxygen-fuel gas cutting. The method is used mainly for profile cutting of stainless steel and aluminum alloys.

Although plasma arc machining typically is a dry process, water is used for water injection plasma arc torches. In these cases, a constricted swirling flow of water surrounds the cutting arc. This operation also may be performed immersed in a water bath. In both cases, water is used to stabilize the arc, to cool the part, and to contain smoke and fumes.

Plastic Wire Extrusion involves applying a plastic material to a metal wire through an extrusion process.

Salt Bath Descaling involves removing surface oxides or scale from a part by immersing the part in a molten salt bath or hot salt solution. Salt bath descaling solutions can contain molten salts,

caustic soda, sodium hydride, and chemical additives. Molten salt baths are used in a salt bath-water quench-acid dip sequence to remove oxides from stainless steel and other corrosion-resistant alloys. In this process, the part typically is immersed in the molten salt, quenched with water, and then dipped in acid. Oxidizing, reducing, or electrolytic salt baths can be used depending on the oxide to be removed. Wastewater generated during salt bath descaling includes spent process solutions, quenches, and rinses.

Shot Tower - Lead Shot Manufacturing involves dropping molten lead from a platform on the top of a tower through a sieve-like device and into a vat of cold water.

Soldering involves joining metals by inserting a thin (capillary thickness) layer of nonferrous filler metal into the space between them. Bonding results from the intimate contact produced by the metallic bond formed between the substrate metal and the solder alloy. The term soldering is used where the melting temperature of the filler is below 425°C (800°F). Some soldering operations use a solder flux, which is an aqueous or nonaqueous material used to dissolve, remove, or prevent the formation of surface oxides on the part.

Except for the use of aqueous fluxes, soldering typically is a dry operation; however, a quench or rinse sometimes follows soldering to cool the part or remove excess flux or other foreign material from its surface. Recent developments in soldering technology have focused on fluxless solders and fluxes that can be cleaned off with water.

Solder Flux Cleaning involves removing residual solder flux from a printed circuit board using either an alkaline or alcohol cleaning solution.

Solder Fusing involves coating a tin-lead plated circuit board with a solder flux and then passing the board through a hot oil. The hot oil fuses the tin-lead to the board and creates a solder-like finish on the board.

Solder Masking involves applying a resistive coating to certain areas of a circuit board to protect the areas during subsequent processing.

Sputtering is a vacuum evaporation process in which portions of a coating material are physically removed from a substrate and deposited a thin film onto a different substrate.

Stripping (Paint) involves removing a paint (or other organic) coating from a metal basis material. Stripping commonly is performed as part of the manufacturing process to recover parts that have been improperly coated or as part of maintenance and rebuilding to restore parts to a usable condition.

Organic coatings (including paint) are stripped using thermal, mechanical, and chemical means. Thermal methods include burn-off ovens, fluidized beds of sand, and molten salt baths. Mechanical methods include scraping and abrasive blasting (as defined in “Abrasive Blasting” in

Section 4.2.2.1). Chemical paint strippers include alkali solutions, acid solutions, and solvents (e.g., methylene chloride).

Wastewater generated during organic coating stripping includes process solutions (limited mostly to chemical paint strippers and rinses).

Stripping (Metallic Coating) involves removing a metallic coating from a metal basis material. Stripping is commonly part of the manufacturing process to recover parts that have been improperly coated or as part of maintenance and rebuilding to restore parts to a usable condition.

Metallic coating stripping most often uses chemical baths, although mechanical means (e.g., grinding, abrasive blasting) also are used. Chemical stripping frequently is performed as an aqueous electrolytic process.

Wastewater generated during metallic coating stripping includes process solutions and rinses. Stripping solutions become contaminated from dissolution of the base metal. Typically, the entire solution is discharged to treatment. Rinsing is used to remove the corrosive film remaining on the parts.

Thermal Infusion uses heat to infuse metal powder or dust onto the surface of a part. Typically, thermal infusion is a dry operation. In some cases, however, water may be used to remove excess metal powder, metal dust, or molten metal.

Ultrasonic Machining involves forcing an abrasive liquid between a vibrating tool and a part. Particles in the abrasive liquid strike the part, removing any microscopic flakes on the part.

Vacuum Impregnation is used to reduce the porosity of the part. A filler material (usually organic) is applied to the surface of the part and polymerized under pressure and heat. Wastewater is generated in this unit operation when rinse water is used to remove residual organic coating from the part.

Vacuum Plating involves applying a thin layer of metal oxide onto a part using molten metal in a vacuum chamber.

Water Shedder involves applying a dilute water-based chemical compound to a part to accelerate drying. This operation typically is used to prevent a part from streaking when excess water remains on the part.

Wet Air Pollution Control involves using water to remove chemicals, fumes, or dusts that are entrained in air streams exhausted from process tanks or production areas. Most frequently, wet air pollution control devices are used with electroplating, cleaning, and coating processes. A common type of wet air pollution control is the wet packed scrubber consisting of a spray chamber that is filled with packing material. Water is continuously sprayed onto the packing and the air stream is pulled through the packing by a fan. Pollutants in the air stream are absorbed by

the water droplets and the air is released to the atmosphere. A single scrubber often serves numerous process tanks; however, the air streams typically are segregated by source into chromium, cyanide, and acid/alkaline sources. Wet air pollution control can be divided into several suboperations, including:

- Wet Air Pollution Control for Acid Alkaline Baths;
- Wet Air Pollution Control for Cyanide Baths;
- Wet Air Pollution Control for Chromium-Bearing Baths; and
- Wet Air Pollution Control for Fumes and Dusts.

Wire Galvanizing Flux involves using flux to remove rust and oxide from the surface of steel wire prior to galvanizing. This provides long-term corrosion protection for the steel wire.

4.2.3 Metals Processed

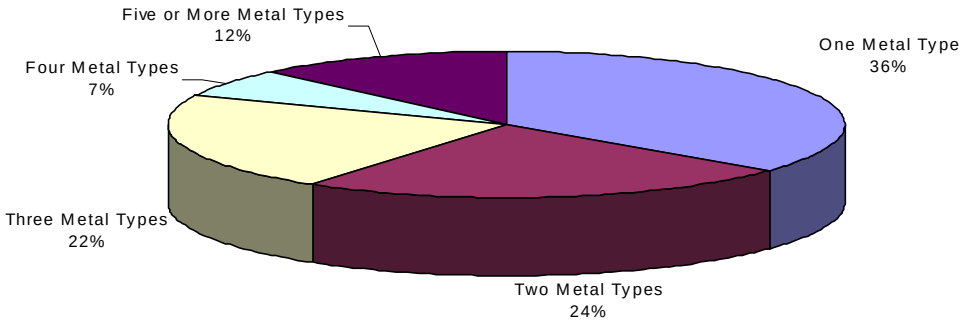
MP&M facilities perform proposed MP&M operations on a variety of metals. EPA identified 29 different metals processed at MP&M facilities from survey results. Of these, iron, aluminum, and copper are the metals most frequently processed. Nickel, tin, lead, gold, and zinc frequently are used in electroplating operations.

Many MP&M facilities process more than one metal. Figure 4-7 shows the percentage of wastewater-discharging MP&M facilities by number of metals processed. As shown in Figure 4-7, 65 percent of the wastewater-discharging MP&M facilities that provided metal use information process more than one metal.

4.2.4 Estimated Annual Wastewater Discharge

Process wastewater is generated in many of the proposed MP&M operations listed in Section 4.2.2. Some operations may be performed with or without water (wet or dry) depending on the purpose of the operation, raw materials used, and final product use. For example, some machining operations (e.g., drilling) are performed without a coolant, while other machining operations (e.g., milling) require a coolant. Process wastewater may be recirculated, recycled or reused as described in Section 4.1.4; however, process wastewater generally is discharged to a treatment system or disposed of through other means (e.g., transfer to CWT).

Based on survey results, the most commonly performed wet proposed MP&M operations are floor cleaning and acid treatment. Survey results also show the most commonly performed proposed MP&M operations do not generate the largest volumes of wastewater. Of the volume of wastewater discharged, 79 percent is generated from rinses, with chemical conversion coating rinsing, acid treatment rinsing, and alkaline treatment rinsing generating the highest volume of wastewater. Table 4-5 lists the proposed MP&M operations and presents the estimated number of MP&M facilities that discharge wastewater generated in each proposed MP&M operation and the estimated annual discharge for the proposed MP&M operation. Note that MP&M facilities typically conduct more than one proposed MP&M operation.



Source: MP&M Survey Database.
Note: Although there are 44,000 wastewater-discharging MP&M facilities only 15,470 are represented in the above pie chart. The 1996 short and municipality surveys did not request metal use information. Additionally, several 1989 and 1996 long survey recipients did not provide this information.

Figure 4-7. Percentage of Wastewater-Discharging MP&M facilities by Number of Metal Processed

Table 4-5

Estimated Number of MP&M Facilities Discharging Process Wastewater by Proposed MP&M Operation and Estimated Annual Discharge[a] for Each Proposed MP&M Operation

Survey Unit Operation Number	Unit Operation	Estimated Number of MP&M Facilities Discharging Wastewater from Unit Operation	Estimated Annual Discharge[b] (gpy)
1	Abrasive Blasting	1,140	38,136,192
1R.	Abrasive Blasting Rinse	2,714	294,364,698
2	Abrasive Jet Machining	1,802	32,882,557
3	Acid Treatment With Chromium	789	4,119,176
3R.	Acid Treatment With Chromium Rinse	1,139	514,116,041
4	Acid Treatment Without Chromium	21,518	307,274,559
4R.	Acid Treatment Without Chromium Rinse	25,886	9,877,473,513
5	Alkaline Cleaning for Oil Removal	15,194	1,017,415,369
5R.	Alkaline Cleaning for Oil Removal Rinse	10,918	7,007,305,341
6	Alkaline Treatment With Cyanide	447	4,260,538
6R.	Alkaline Treatment With Cyanide Rinse	529	43,781,206
7	Alkaline Treatment Without Cyanide	16,200	276,426,070
7R.	Alkaline Treatment Without Cyanide Rinse	12,937	4,782,461,104
8	Anodizing With Chromium	275	271,552
8R.	Anodizing With Chromium Rinse	358	145,962,877
9	Anodizing Without Chromium	1,090	5,430,253
9R.	Anodizing Without Chromium Rinse	1,587	1,303,183,805
10	Aqueous Degreasing	41,220	669,348,451
10R.	Aqueous Degreasing Rinse	28,923	517,175,686
11	Assembly/Disassembly	2,031	18,107,602
11R.	Assembly/Disassembly Rinse	2,189	796,489
12	Barrel Finishing	14,632	640,037,840
12R.	Barrel Finishing Rinse	6,694	539,294,744
13	Burnishing	4,920	132,891,318
13R.	Burnishing Rinse	2,881	326,955,097
14	Chemical Conversion Coating Without Chromium	9,357	564,137,211

Table 4-5 (Continued)

Survey Unit Operation Number	Unit Operation	Estimated Number of MP&M Facilities Discharging Wastewater from Unit Operation	Estimated Annual Discharge[b] (gpy)
14R.	Chemical Conversion Coating Without Chromium Rinse	11,582	6,042,069,830
15	Chemical Milling	1,466	41,355,172
15R.	Chemical Milling Rinse	2,323	645,522,600
16	Chromate Conversion Coating	5,071	54,795,746
16R.	Chromate Conversion Coating Rinse	5,980	1,707,025,516
17	Corrosion Preventive Coating	2,262	41,326,563
17R.	Corrosion Preventive Coating Rinse	1,015	287,465,378
18	Electrical Discharge Machining	1,323	934,885
18R.	Electrical Discharge Machining Rinse	559	3,368,479
19	Electrochemical Machining	294	329,427,414
19R.	Electrochemical Machining Rinse	258	34,587,020
20	Electroless Plating	2,583	18,034,222
20R.	Electroless Plating Rinse	3,664	565,437,766
21	Electrolytic Cleaning	5,280	33,756,614
21R.	Electrolytic Cleaning Rinse	6,886	1,501,249,740
22	Electroplating With Chromium	1,019	37,242,632
22R.	Electroplating With Chromium Rinse	1,937	678,282,897
23	Electroplating With Cyanide	1,958	38,162,499
23R.	Electroplating With Cyanide Rinse	8,885	686,691,868
24	Electroplating Without Chromium or Cyanide	4,558	92,968,816
24R.	Electroplating Without Chromium or Cyanide Rinse	13,644	3,778,033,165
25	Electropolishing	442	633,484
25R.	Electropolishing Rinse	458	70,178,477
26	Floor Cleaning	49,002	797,062,121
26R.	Floor Cleaning Rinse	3,580	45,391,545
27	Grinding	8,738	169,740,183
27R.	Grinding Rinse	263	72,465,147
28	Heat Treating	1,609	156,660,147
28R.	Heat Treating Rinse	1,315	2,186,067,713
29	Impact Deformation	404	40,582,591
29R.	Impact Deformation Rinse	148	8,237,308
30	Machining	16,935	585,628,906

Table 4-5 (Continued)

Survey Unit Operation Number	Unit Operation	Estimated Number of MP&M Facilities Discharging Wastewater from Unit Operation	Estimated Annual Discharge[b] (gpy)
30R.	Machining Rinse	683	149,922,705
31	Metal Spraying	91	866,823,774
32	Painting - Spray or Brush	2,303	3,009,847,635
32R.	Painting - Spray or Brush Rinse	688	726,589,166
33	Painting - Immersion	450	164,139,746
33R.	Painting - Immersion Rinse	404	190,487,578
34	Plasma Arc Machining	547	10,728,876
35	Polishing	1,111	113,097,868
35R.	Polishing Rinse	2,745	567,887,844
36	Pressure Deformation	520	241,040,874
36R.	Pressure Deformation Rinse	249	783,831,607
37	Salt Bath Descaling	99	62,703
37R.	Salt Bath Descaling Rinse	111	53,938,360
38	Soldering/Brazing	1,258	425,688,291
38R.	Soldering/Brazing Rinse	4,905	231,488,012
39	Solvent Degreasing[c]	2,288	8,128,901
39R.	Solvent Degreasing Rinse	824	108,089,561
40	Stripping (paint)	1,730	68,326,631
40R.	Stripping (paint) Rinse	2,720	295,059,493
41	Stripping (metallic coating)	2,929	5,855,277
41R.	Stripping (metallic coating) Rinse	3,867	943,853,805
42	Testing	5,947	3,713,880,058
42R.	Testing Rinse	1,093	46,615,860
43	Thermal Cutting	228	35,395,401
43R.	Thermal Cutting Rinse	64	2,940,934
44	Washing Finished Products	17,276	1,975,525,613
44R.	Washing Finished Products Rinse	5,378	651,385,578
45	Welding	1,003	1,177,301,469
45R.	Welding Rinse	360	44,297,886
46AA	Wet Air Pollution Control for Acid Alkaline Baths	2,726	1,335,631,480
46CN	Wet Air Pollution Control for Cyanide Baths	189	43,321,771
46CR	Wet Air Pollution Control for Chromium-Bearing Baths	942	234,814,961

Table 4-5 (Continued)

Survey Unit Operation Number	Unit Operation	Estimated Number of MP&M Facilities Discharging Wastewater from Unit Operation	Estimated Annual Discharge[b] (gpy)
46FD	Wet Air Pollution Control for Fumes and Dusts	657	30,596,886
46OR	Wet Air Pollution Control for Organic Constituents	347	19,613,181
50	Carbon Black Deposition	20	31,848
50R.	Carbon Black Deposition Rinse	43	2,377,389
51	Bilge Water	11	69,949,548
51R.	Bilge Water Rinse	8	304,839
54R.	Galvanizing/Hot Dip Coating Rinse	69	225,928,671
56	Mechanical Plating	246	27,717,634
56R.	Mechanical Plating Rinse	240	202,002,940
57	Photo Image Developing	1,456	430,595,569
57R.	Photo Image Developing Rinse	1,531	603,943,807
58	Photo Imaging	9	27,900
58R.	Photo Imaging Rinse	9	497,022
59	Photoresist Applications	15	7,157
59R.	Photoresist Applications Rinse	17	180,161
62	Solder Flux Cleaning	99	1,694,799
62R.	Solder Flux Cleaning Rinse	461	214,927,721
63	Solder Fusing	27	5,739,846
63R.	Solder Fusing Rinse	280	55,114,403
65	Steam Cleaning	26	18,130,100
65R.	Steam Cleaning Rinse	16	15,851,628
66	Vacuum Impregnation	8	649,893
66R.	Vacuum Impregnation Rinse	98	10,144,137
70	Kerfing	30	7,429,800
71	Adhesive Bonding	186	525,950
72	Calibration	55	2,467
73R.	Cyanide Rinsing Rinse	22	33,490
74	Hot Dip Coating	9	692
74R.	Hot Dip Coating Rinse	75	28,135,640
76	Thermal Infusion	62	138,939
78	Phosphor Deposition	11	4,283
78R.	Phosphor Deposition Rinse	11	42,826
80	Chromium Drag-out Reduction	8	857,994

Table 4-5 (Continued)

Survey Unit Operation Number	Unit Operation	Estimated Number of MP&M Facilities Discharging Wastewater from Unit Operation	Estimated Annual Discharge[b] (gpy)
83	Acid Pickling Neutralization	8	22,761
83R.	Acid Pickling Neutralization Rinse	16	22,497,118
87	Tin Catalyst	385	295,415
87R.	Tin Catalyst Rinse	468	102,883,125
88	Catalyst Acid Pre-Dip	961	680,949
88R.	Catalyst Acid Pre-Dip Rinse	1,108	64,173,379
90	Photoresist Strip	439	8,039,179
90R.	Photoresist Strip Rinse	732	312,703,073

Source: MP&M Survey Database.
[a]EPA used MP&M survey information to generate the estimated facility counts and estimated annual discharge.
[b]These totals do not include facilities generating process wastewater that is contract hauled off site or not discharged.
[c]Solvent degreasing operations that use process water are included under alkaline treatment (see unit operation 5).

4.3 Trends in the Industry

To develop the MP&M rule, EPA collected data from the MP&M industry for over 10 years, including detailed information from surveys in 1990, 1996, and 1997. Survey data and results of industry site visits and sampling episodes showed numerous changes in the industry between 1990 and 1996. Survey data indicate a greater than 30-percent industry increase in the use of wastewater treatment systems between 1990 and 1996. Many facilities also have begun to implement advanced treatment systems that include ultrafiltration for increased organic pollutant removal and microfiltration units to improve clarification. The MP&M survey database indicates that in 1990, 260 of the MP&M facilities with wastewater treatment in place were using membrane filtration. By 1996, that number increased to 700. In addition, facilities are moving toward greater implementation of pollution prevention and water reduction, including progression to zero discharge when possible. Fifty-three percent currently have in-process pollution prevention or water use reduction practices in place, and over 27 percent of discharging facilities report having wet unit operations with zero discharge. Improvements in treatment controls are allowing for more automated process controls, which leads to more consistent wastewater treatment. Advances in wastewater treatment chemicals also result in higher treatment efficiencies.

4.4 References

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